



Project 90-198  
March, 1991

**Canonie**Environmental

Final Work Plan

---

# Interim Remedy Remedial Design Work Plan

---

Superfund Site at 216 Paterson Plank Road at  
Carlstadt, New Jersey

---

Prepared For:

The Cooperating PRP Group

Final Work Plan

# **Interim Remedy Remedial Design Work Plan**

100214

**Canonie**Environmental

## WORK PLAN

### INTRODUCTION

Canonie Environmental Services Corp. (Canonie) has been retained by the cooperating Potentially Responsible Party Group (Group) to design and construct the Interim Remedy for the Scientific Chemical Processing (SCP) Superfund Site (the Site) located at 216 Paterson Plank Road in Carlstadt, New Jersey. This Work Plan is the first deliverable pursuant to the United States Environmental Protection Agency's Administrative Order ("Index No. II CERCLA-00116" dated September 28, 1990).

This Work Plan consists of eight sections. Each section contains one of the required plans for the performance of the remedial design activities in accordance with Attachment 8, "Statement of Work", of the Administrative Order.

This Work Plan was issued in final form on March 22, 1991 and given conditional approval by the United States Environmental Protection Agency on April 5, 1991. The conditions of approval were that 31 specific amendments be incorporated into the Work Plan. Those amendments have been incorporated and the amended Work Plan was reissued on April 16, 1991.

100215

**Canonie**Environmental

## TABLE OF CONTENTS

	<u>PAGE</u>
LIST OF TABLES	i
LIST OF FIGURES	ii
LIST OF APPENDICES	iii
INTRODUCTION	
SECTION 1.0 SITE MANAGEMENT PLAN FOR DESIGN ACTIVITIES	
SECTION 2.0 SAMPLING, ANALYSIS, AND MONITORING PLAN FOR DESIGN ACTIVITIES	
SECTION 3.0 QUALITY ASSURANCE PROJECT PLAN FOR DESIGN ACTIVITIES	
SECTION 4.0 HEALTH AND SAFETY PLAN FOR DESIGN ACTIVITIES	
SECTION 5.0 PROJECT SCHEDULE	
SECTION 6.0 ACCESS AND APPROVALS PLAN FOR DESIGN ACTIVITIES	
SECTION 7.0 PRELIMINARY DESIGN REPORT	
SECTION 8.0 SITE MAINTENANCE PLAN FOR DESIGN ACTIVITIES	
REFERENCES	
TABLES	
FIGURES	
APPENDICES	

## LIST OF TABLES

<u>TABLE NUMBER</u>	<u>TITLE</u>
2-1	Geotechnical Sampling Schedule for Remedial Design
2-2	Boring Log Legend
4-1	Chemical Information for Identified or Suspected Chemicals
4-2	Activity-Specific Levels of Protection
4-3	Site-Specific Air Monitoring Program
6-1	Schedule for Obtaining Access and Approvals for Remedial Design Activities

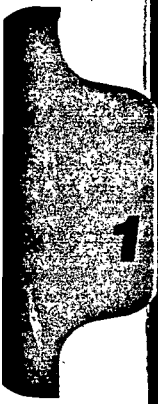
## LIST OF FIGURES

<u>FIGURE NUMBER</u>	<u>DRAWING NUMBER</u>	<u>TITLE</u>
1-1	90-198-B1	Project Organization Chart
2-1	90-198-E6	Topographic Base Map
2-2	90-198-B13	Property Owner Map
2-3	90-198-E14	Slurry Wall/Boring Location Plan
2-4	90-198-A7	Permeability Versus Percent Bentonite
5-1	90-198-B21	Schedule for Remedial Design
5-2	90-198-B22	Draft Schedule for Remedial Construction
5-3	90-198-B20	Draft Schedule for Operation and Maintenance
7-1	90-198-A11	Typical Slurry Wall Section
7-2	90-198-A19	Gundwall Sheet Pile Cross Section
7-3	90-198-A8	Proposed Infiltration Barrier Section
7-4	90-198-A17	Dewatering Well Schematic
7-5	90-198-A9	Sheet Pile Detail
7-6	90-198-A10	Lower Bench Schematic
D-1	90-198-A26	Map of Directions to the Nearest Hospital
H-1	90-198-A23	Total Well Yield with Declining Water table

## LIST OF APPENDICES

APPENDIXTITLE

A	Resumes of Key Personnel
B	Health and Safety Plan Amendments
C	Heat and Cold Stress
D	Map of Directions to the Nearest Hospital
E	Health and Safety Plan Acknowledgement Form
F	Summary of Chemical Data
G	Property Access Agreement
H	Preliminary Performance Analysis of Dewatering Wells



SECTION 1

SITE MANAGEMENT PLAN  
FOR DESIGN ACTIVITIES  
MARCH 1990

## TABLE OF CONTENTS

	<u>PAGE</u>
1.1 INTRODUCTION	1-1
1.2 SITE HISTORY	1-2
1.3 CANONIE PROJECT ORGANIZATION AND RESPONSIBILITIES	1-7
1.4 SUBCONTRACTORS	1-11

## SITE MANAGEMENT PLAN FOR DESIGN ACTIVITIES

### 1.1 INTRODUCTION

Canonie Environmental Services Corp. (Canonie) has prepared this Site Management Plan for the design of the Interim Remedy for the Scientific Chemical Processing (SCP) Superfund Site (the Site). This plan describes Canonie's key responsible employees and their responsibilities. The subcontractors who will perform work on this Site are also identified in the plan. Supplemental information on additional major subcontractors or changes in key responsible employees who may become involved with the work on the Site will be made available to representatives from the United States Environmental Protection Agency (EPA), the New Jersey Department of Environmental Protection (NJDEP), and any other interested New Jersey agency through the Facility Coordinator, Donald J. Murphy, Ph.D., P.E., of Langan Environmental Services, Inc.

This plan has been prepared to be consistent with the guidance found in Attachment 8, Statement of Work, which is part of Administrative Order Index Number II Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)-00116.

## 1.2 SITE HISTORY

Details relative to site history, including summaries of information from the Remedial Investigation and Feasibility Study (RI/FS), are contained in the EPA's Record of Decision (ROD). For the purpose of the Remedial Design Work Plan, the following were excerpted from the ROD.

The SCP Site is located at 216 Paterson Plank Road, in the Borough of Carlstadt, Bergen County, New Jersey. The site is bounded by Paterson Plank Road on the south; Gotham Parkway on the west; Peach Island Creek, a tributary to Berry's Creek on the north; and a trucking company on the east. The Site covers approximately 5.9 acres of relatively flat, sparsely vegetated land. The Site is fenced on three sides (east, west, and south), with a locked main entrance gate on Paterson Plank Road.

Land use in the vicinity of the Site is classified as light industrial.

The population of the Borough of Carlstadt resides mainly within the residential and commercial areas of the borough, however, there are three dwellings which exist within approximately one mile of the Site.

Lands bordering Peach Island Creek and Berry's Creek are classified as water front recreation zones. The Site is located within the Hackensack Meadowlands District, an extensive area of salt water marshes drained by the Hackensack River and its tributaries.

Ground water in the water table aquifer underlying the Site flows into Peach Island Creek. Water in this aquifer also flows towards Gotham Parkway, Paterson Plank Road, and the adjoining property to the east. A significant component of ground water flow is also downward.

The Site, which is owned by Inmar Associates, Inc., was operated during the 1970s by Scientific Chemical Processing, Inc., for the handling, treatment, and disposal of a wide variety of industrial and chemical wastes. Similar operations also occurred on the Site prior to 1970. In 1980, operations at

the facility ceased. In 1983, the Site was placed on the National Priorities List.

On or about May 17, 1985, the EPA issued notice letters to approximately 140 Potentially Responsible Parties (PRPs), offering them the opportunity to undertake a RI/FS at the Site. The purpose of the RI/FS was to determine the nature and extent of contamination at the SCP Site, and to develop remedial alternatives to address that contamination. On September 30, 1985, the EPA issued an Administrative Order of Consent to 108 of the PRPs who agreed to conduct the RI/FS. On October 23, 1985, the EPA issued a Unilateral Administrative Order to 31 PRPs who failed to sign the Consent Order, requiring them to cooperate with the 108 consenting parties and participate in the RI/FS.

On October 23, 1985, the EPA also issued an Administrative Order to the site owner, Inmar Associates, Inc., requiring the company to remove and properly dispose of the contents of five tanks containing wastes contaminated with polychlorinated biphenyls (PCBs) and numerous other hazardous substances. Inmar Associates, Inc. completed the removal of four of these tanks by the summer of 1986.

The cooperating PRPs initiated the RI/FS in April 1987.

In summary, the RI results indicate the following:

- o On-site soils, both at the surface and down to a depth of at least 10 to 12 feet, are heavily contaminated with hazardous substances, including volatile and semi-volatile organic compounds, pesticides, PCBs, and inorganic compounds;
- o The shallow ground water at the Site is heavily contaminated with hazardous substances, including volatile and semi-volatile organic compounds, pesticides, and inorganic compounds;

- o Hazardous substances have migrated from the First Operable Unit (FOU) down into and through the clay layer (which lies between the water table aquifer and deeper aquifer) into the till and bedrock aquifers at the Site;
- o Ground water in the till and bedrock aquifers at the Site is contaminated with a number of hazardous substances and pollutants and contaminants, including some volatile and semi-volatile organic compounds;
- o Hazardous substances similar in type and/or identical to those found in the soils in the FOU have been found in the water table, till, and bedrock aquifer;
- o Surface water and sediment in Peach Island Creek, which flows adjacent to the Site, are contaminated with hazardous substances similar in type and/or identical to those which were found in the soils and ground water at the site.

The SCP Site is extremely complex, because of the wide variety of contaminants present, the high concentrations of contaminants detected, and the many potential migration routes for these contaminants. Consequently, the EPA divided the response actions for the Site into several operable units (OUs). The OUs for the Site were defined by the EPA as follows:

1. OU 1: This OU will address remediation of conditions in the FOU at the Site, including remediation of contaminated soils and ground water above the clay layer;
2. OU 2: This OU will address remediation of conditions outside the FOU, including remediation of the contamination in the till and bedrock aquifers and Peach Island Creek.

The feasibility study completed for the FOU demonstrated that, in order to treat the heavily contaminated saturated soil, it would be necessary to first remove the shallow ground water from this unit (i.e., to dewater this unit). This system consists of:

1. Installation of an underground slurry wall around the FOU, down to the clay layer;
2. Extraction of ground water from within the FOU;
3. Subsequent treatment and disposal of the ground water to be removed from the FOU.

Although the EPA is planning further work to evaluate treatment technologies for the soils and sludges in the FOU, there was enough information for the EPA to select an interim action to temporarily reduce migration of contaminants out of the FOU until further studies of the Site are completed and a final remedy for the FOU is selected.

The RI indicates that hazardous substances have been released onto the soils and into the ground water at the Site. Furthermore, such hazardous substances have migrated and continue to migrate from the soils and water table aquifer in the FOU into underlying ground water aquifers and into Peach Island Creek, a tidal waterway adjoining the Site. The presence of the many hazardous substances, pollutants, and contaminants in the soil and in the water table aquifer in the FOU pose a potential threat of continued release of such substances.

The Interim Remedy selected by the EPA and documented in its ROD dated September 14, 1990 consists of:

- o Installation of a slurry wall along the perimeter of the FOU which will extend from the surface of the Site down into the clay-silt layer located at the lower boundary of the FOU (approximately 15 to 20 feet below the surface of the site);

- o Installation of a ground water collection and extraction system in the FOU which will be capable of lowering and maintaining the water table in this unit at the lowest practicable level;
- o Extraction of ground water from the FOU to achieve and continuously maintain the water level in the FOU at the lowest practicable level;
- o Transportation of all ground water extracted from the FOU to an appropriate off-site facility for treatment and disposal;
- o Installation of a temporary infiltration barrier across the FOU which will be capable of minimizing the entry of precipitation into the FOU;
- o Operation and maintenance of the ground water collection and extraction system, and maintenance of the infiltration barrier and the slurry wall;
- o Implementation of a program for ground water and surface water monitoring to measure the presence within the FOU and the potential for migration of hazardous substances from the FOU, until such time that the final remedy is in place.

### 1.3 CANONIE PROJECT ORGANIZATION AND RESPONSIBILITIES

Responsibilities of key personnel in the project are described below. The organization chart for the Remedial Design Report activities is shown on Figure 1-1. Resumes for all of these personnel are contained in Appendix A of this plan. If any additional or replacement key personnel should be needed during the course of this project, the EPA, NJDEP, and any other interested state agency will be notified of such persons, names, duties, and qualifications through the Facility Coordinator, Mr. Donald J. Murphy, Ph.D., P.E., of Langan Environmental Services, Inc.

Canonie Vice President - Eastern Operations - The vice president, Mr. John J. Grocki, will be the principal in charge of the project. His responsibilities shall include:

- o Providing strategic advice on key issues;
- o Assisting the project manager to secure the resources necessary to ensure successful completion of the project.

Canonie Project Manager - The project manager, Mr. Joseph Mihm, will be responsible for the overall management of the project. The responsibilities of the project manager shall include:

- o Managing technical, financial, and scheduling matters;
- o Reviewing and approving project deliverables to ensure compliance with project and contractual requirements.

Canonie Project Supervisor - The project supervisor, Mr. Jerry Snyder, will be responsible for management and coordination of the day-to-day project activities. These responsibilities shall include:

- o Communicating on a day-to-day basis with the cooperating PRP Group's Facility Coordinator, Donald J. Murphy, Ph.D., P.E., of Langan Environmental Services, Inc.;
- o Preparing draft monthly progress reports to the Facility Coordinator;
- o Assisting the Group with any communication with regulatory agencies such as the EPA Region II and NJDEP;
- o Providing technical direction to the technical staff;
- o Communicating daily with the project team;
- o Meeting at least weekly with the project manager to review status of the project.

Canonie Responsible Design Engineer - The responsible design engineer, Mr. Jeffrey Klaiber, will be responsible for:

- o Preparing the work plan and the design report;
- o Providing technical direction to the technical staff;
- o Communicating with the project supervisor daily;
- o Monitoring the activities of the technical staff and subcontractors;
- o Reviewing, approving, and stamping the Design Report and drawings as the Professional Engineer of record.

Canonie Technical Reviewer - The technical reviewer, Dr. Daekyoo Hwang, will provide independent expert review of the work plan and design report. Additional responsibilities of the technical reviewer will include:

- o Consulting with the technical staff on design issues;
- o Communicating with the project supervisor and project manager.

Canonie Constructibility Reviewer - The constructibility reviewer, Mr. Robert Reichert, will review the work plan and design report for constructibility. His duties will include:

- o Consulting with the project supervisor and project manager;
- o Communicating with the technical staff;
- o Coordinating review activities with the technical reviewer.

Canonie Health and Safety Officer - The health and safety officer, Mr. Clayton Bock, will be responsible for:

- o Developing health and safety procedures for the design and construction phases of the project;
- o Communicating all health and safety requirements to all personnel entering the Site;
- o Communicating the status of compliance with health and safety requirements to the project supervisor and project manager;
- o Maintaining records of monitoring and other activities.

The following individuals will assist in production of the Design Report:

- o David Dekker, construction superintendent, will perform constructibility checks on the design with emphasis on field conditions.
- o Frank Gontowski will perform geotechnical engineering and will be responsible for infiltration barrier, liner, and slurry wall specifications.
- o Rich Greenwood will assist Mr. Gontowski with the details of geotechnical engineering.
- o Stephen Pierce will oversee the production of the Design Report.
- o Roman Popielak will be responsible for design details related to hydrogeology and ground water pumping.
- o Michael Strebeck will perform the quality assurance/quality control review.
- o Chris ten Braak will supervise the on-site drilling and boring program.



#### 1.4 SUBCONTRACTORS

Subcontractors will be utilized for performing various field and laboratory activities for the project. The following is a list of subcontractors and their respective duties. If any additional or replacement subcontractors should be needed during this phase of the project, the EPA, NJDEP, and any interested New Jersey agency will be notified through the Facility Coordinator, Donald J. Murphy of Langan Environmental Services, Inc., with this supplemental information.

Geotesting Services, Inc. from Clifton, New Jersey will be used to perform selected geotechnical testing, conventional consolidation, unconfirmed compressive strength, and permeability classification tests.

Empire Soils Investigations, Inc. from Edison, New Jersey will drill the borings.

Andrew Marshall, Jr., P.E., L.S. from Ridgewood, New Jersey will be used for any surveying services required while this plan is in effect.



SECTION 2

SAMPLING, ANALYSIS, AND MONITORING PLAN  
FOR DESIGN ACTIVITIES  
MARCH 1991

## TABLE OF CONTENTS

	<u>PAGE</u>
2.1 INTRODUCTION	2-1
2.1.1 Site Description	2-2
2.1.2 Site History	2-2
2.1.3 Site Geology	2-3
2.1.4 Project Scope	2-6
2.1.4.1 Task 1 - Soil Boring Program	2-6
2.1.4.2 Task 2 - Bentonite Backfill Testing	2-9
2.1.4.3 Task 3 - Ground Water Sample Collection	2-9
2.1.4.4 Task 4 - Compatibility Testing	2-11
2.1.4.5 Task 5 - Data Evaluation and Reporting	2-12
2.2 GEOTECHNICAL SAMPLING RATIONALE	2-13
2.3 GEOTECHNICAL SAMPLING EQUIPMENT AND TEST PROCEDURES	2-14
2.3.1 Surveying	2-14
2.3.2 Drilling	2-14
2.3.3 Backfilling/Grouting	2-16
2.3.4 Permeability and Compatibility Testing	2-16
2.3.5 Geotechnical Testing Procedures	2-19
2.4 SCHEDULE	2-21
2.5 HEALTH AND SAFETY	2-22

# SAMPLING, ANALYSIS, AND MONITORING PLAN FOR DESIGN ACTIVITIES

## 2.1 INTRODUCTION

This plan describes the specific sampling, testing, remedial measures, and analysis required to obtain data needed for the design of the Interim Remedy (e.g., slurry wall, infiltration barrier, dewatering system) for the first operable unit (FOU) at the Site.

This plan has been prepared in accordance with the following guidance documents:

1. Attachment 8 of the Administrative Order for Consent Index Number 00116 - Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the Site (September 28, 1990).
2. The New Jersey Department of Environmental Protection (NJDEP) Field Sampling Procedures Manual, February 1988.
3. The United States Environmental Protection Agency (EPA) Slurry Trench Construction for Pollution Migration Control, EPA 540/2-84-001 February 1984.
4. The EPA National Contingency Plan, 40 Code of Federal Regulations (CFR) 300 et seq.
5. American Society for the Testing of Materials (ASTM) Volume 4.08.
6. EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW846, EPA 8704-0107.

Section 2.1 of this plan describes the project scope. Section 2.2 defines the rationale for the geotechnical sampling and testing. Section 2.3 describes the sampling equipment and procedures, and the project schedule for design-related field activities is presented in Section 2.4.

### 2.1.1 Site Description

The Site is located in northeastern New Jersey at 216 Paterson Plank Road in Carlstadt Borough, Bergen County, New Jersey. It is bounded by Peach Island Creek on the north, Paterson Plank Road on the south, an industrial facility on the east, and Gotham Parkway on the west.

The Site is located within the Hackensack Meadowlands. This area consists primarily of salt water marshes that are drained by the Hackensack River and its tributaries. Berry's Creek, a Hackensack River tributary, drains approximately 800 acres of marshland in the vicinity of the Site. Peach Island Creek, a tributary of Berry's Creek, flows adjacent to the Site (Figure 2-1).

The Site is a relatively-flat, sparsely-vegetated area totalling approximately 5.9 acres. It is enclosed by a fence on three sides (south, east, and west) with the entrance near the southeast corner allowing access to Paterson Plank Road. The north side is bounded by Peach Island Creek, which accounts for the lack of fencing on this side of the Site. Figure 2-2 shows owners of properties within 200 feet of the Site.

The remedial investigation (RI) conducted by Dames & Moore indicates that the Site previously contained a tank farm, drum storage areas, a still and boiler house, and a staging platform with a thin-film evaporation area. Presently, only one tank remains at the Site (Tank T-5) and it contains wastes contaminated with polychlorinated biphenyls (PCBs) and numerous other hazardous substances. This tank was placed in a roll-off container during the earlier removal action at the Site. The tank and additional site features are indicated on Figure 2-3.

### 2.1.2 Site History

From the early 1940s through approximately 1965, part of the Site was owned and operated by North Jersey Refining Company as an oil and solvent recovery facility. In 1965, the property owned by North Jersey Refining Company was purchased by Sparrow Realty (now Inmar Associates) and leased to Scientific Chemical Treatment Company, Inc. (SCTC). SCTC continued to

operate the Site as a solvent and waste recovery facility. In 1970, Inmar leased the property to Scientific Chemical Processing (SCP) who also operated a waste and solvent recovery facility. In 1976 and 1977, Inmar purchased two additional lots which, together with the property originally owned by North Jersey Refining Company, make up the 5.9-acre site. Operations at the Site ceased in 1980.

### 2.1.3 Site Geology

Based on information contained in the RI and in the Test Pit Report (Dames and Moore, August 24, 1990), the stratigraphy at the Site consists of the following:

- o Fill;
- o Peat;
- o Gray Silt;
- o Varved Clay;
- o Red Clay;
- o Till;
- o Bedrock.

Each of these units is described below.

#### Fill

The Site is covered with man-made fill. The composition of this fill is extremely variable and heterogeneous, consisting of various soils, construction debris and demolition rubble. The fill thickness ranges from 3 to 11 feet, with an average thickness of approximately 8.4 feet. The fill is thinnest near Peach Island Creek and increases in thickness toward Paterson Plank Road.

### Peat

Peat, the youngest of the naturally-occurring materials at the Site, originated from former marsh vegetation. Its thickness decreases from Peach Island Creek to Paterson Plank Road and in places it is completely absent. This is most likely due to the high water content of the peat (Harris, October 1972) and underlying soft silt, which may have been displaced when fill was placed. The peat thickness ranges from 0 to 7 feet, with an average thickness of approximately 1.8 feet. At one location, fine sand which appears natural, overlies the peat indicating the presence of localized channel scouring and filling.

### Gray Silt

In sharp contact with the peat is a silt layer of almost constant thickness (approximately two feet) throughout the Site. Generally, this is massive (i.e., bedding is not readily observable) except for rare laminations. This material is extensively mottled, indicating reducing conditions. The nature of the reducing material could not be identified from field observations.

### Varved Clay

In sharp contact with the overlying gray silt is a wedge-shaped unit of varved clay, thickest toward Peach Island Creek and thinner toward Paterson Plank Road. The thickness of this material ranges from 0 to 18 feet. The upper surface is approximately horizontal, while the lower surface is inclined.

### Red Clay

Proceeding from Peach Island Creek to Paterson Plank Road, the varved clay yields to a massive red clay unit (zero to eight feet in thickness) and a sand unit. It is expected that the varved clay overlaps the red clay and possibly the sand unit. However, the sand unit could be channel scoured

and filled into the varved clay. In this latter case, a stream channel could have been eroded into the clay, and then naturally backfilled with sand. The RI states that the varved clay unit is continuous throughout the Site, but thins toward the south.

### Till

The deepest unconsolidated unit at the Site is the Wisconsin till, approximately 20-feet thick. Within this unit three separate members can be identified:

1. Clean sand;
2. Massive clay;
3. Sand and gravel.

Clean sand was identified only in the southern corner of the Site (MW-1S) and occurs at the top of the till. The exact genetic relation of this sand to the till is not known. Two possible explanations for its origins are:

1. Erosion of a stream channel into the underlying clay and deposition in the stream bed (scour and fill);
2. Fluvioglacial deposition over the massive clay.

A wedge-shaped body of massive (i.e., bedding is not readily discernible) red clay occupies the top of the till. This unit is thickest toward Patterson Plank Road and attenuates rapidly toward Peach Island Creek.

The bulk of the till is a heterogeneous mixture of sand and gravel.

## Bedrock

On the basis of on-site borings and regional geological data, the bedrock is identified as reddish brown shale of the Brunswick Formation.

Information from the on-site borings, combined with information from work performed for the Meadowlands Sports Complex, indicate that the Site is located on the eastern flank of the north-south trending glacial valley, very near the ridge that separates this valley from the one to the east.

### 2.1.4 Project Scope

A field investigation will be performed to provide additional geotechnical data for the design of the Interim Remedy. The tasks to be performed as part of this field investigation include preparation of this project plan, a soil boring program, compatibility testing, and data evaluation and reporting. These tasks are described in detail below.

#### 2.1.4.1 Task 1 - Soil Boring Program

The purpose of the soil boring program is to collect geotechnical information essential for the design and construction of the slurry wall and sheet pile wall. Specifically, the purpose of the soil boring program is to determine the depth to the clay layer and thickness of the clay layer around the perimeter of the Site. Figure 2-3 depicts the proposed locations of the soil borings for the investigation.

The soil boring program will consist of drilling 18 borings spaced approximately 100 to 150 feet apart, along the proposed alignment of the slurry wall (Figure 2-3). The test borings will be performed utilizing industry-standard drilling techniques. All borings will be performed using 3-1/2 inch inside diameter hollow-stem augers. No mud drilling techniques will be utilized. Soil samples will be collected on a continuous basis using a split-spoon sampler or Shelby tubes. Continuous sampling will be performed in order to determine, as accurately as possible, the stratigraphic profile at the Site. The Shelby tubes will be utilized for collecting undisturbed samples from selected locations.

Split-spoon sampling will be performed using the Standard Penetration Test (SPT) boring method in accordance with ASTM D1586-84. The split-spoon sampler will possess an inside diameter of 1-3/8 inches and an outside diameter of 2 inches. The split-spoon sampler will be 24-inches long. Split-spoon samples will be obtained by advancing the augers to the top of the desired depth interval to be sampled. The drilling tools will then be removed from the inside of the augers, at which point the split-spoon sampler will be attached to the drilling rod and lowered to the bottom of the borehole. The sampler will be driven into the soil using a 140-pound hammer dropped a distance of 30 inches. The split-spoon sampler will be advanced in this manner for a distance of two feet. The number of blows required to drive the split-spoon sampler over each six-inch interval will be recorded.

Shelby tube sampling will be performed in accordance with ASTM D1587-83. The Shelby tubes will possess an outside diameter of either two or three inches. Shelby tube samples will be obtained by advancing the augers to the top of the depth interval to be sampled. The drilling tools will then be removed from the inside of the augers, at which point the Shelby tube will be attached to the drilling rod and lowered to the bottom of the borehole. The Shelby tube will then be hydraulically pushed into the soil approximately two feet. The Shelby tube will then be allowed to remain in place for approximately five minutes to allow the sampled soils to expand inside the tube. The Shelby tube will then be rotated to shear the soils at the bottom of the tube from the interface soils. This will be performed by turning the drilling rods.

The soils sampled will be classified in accordance with both the Burmister Soil Classification System (BSCS) and the Unified Soils Classification System (USCS, as outlined by ASTM D2487). The field information to be collected is shown on the boring log legend given in Table 2-2. Final boring logs will include soil classification with both the USCS and BSCS.

At a minimum, selected samples which will be sent to the geotechnical laboratory will be tested for:

1. Specific gravity, density, moisture content, and grain size determination;
2. Atterberg limits;
3. Permeability;
4. Unconfined compressive strength;
5. Consolidation.

The number of samples from each stratum to be sent for geotechnical testing is given in Table 2-1.

Selected soil samples collected during the boring program will be forwarded to Geotesting Services, Inc. (GSI) laboratory in Clifton, New Jersey for geotechnical testing. Other soil samples will be visually classified and placed with the drill cuttings adjacent to the borehole. The drill cuttings will be consolidated for placement under the infiltration barrier. No analytical (i.e., chemical) testing will be performed on the samples obtained.

All soil borings will be permanently sealed by a licensed well driller in accordance with New Jersey regulations. The procedures for sealing soil borings are described in Section 2.3.2. Since the Site is a CERCLA site, drilling permits are not required. Nonetheless, Canonie will obtain drilling permits for borings B-1, B-6, B-11, and B-14 which are the only borings expected to be deeper than 25 feet.

#### 2.1.4.2 Task 2 - Bentonite Backfill Testing

A geotechnical laboratory testing program will be carried out to determine the amount of bentonite required to achieve and maintain a backfill permeability of  $1 \times 10^{-7}$  centimeters per second (cm/sec). Because of the poor quality of the soil/fill material on-site, backfill material for construction of the slurry wall will come from an off-site borrow area which has been tentatively identified as Liza Common fill from the Mount Hope Quarry. The selection of a backfill material source will be finalized during the design phase. Composite soil samples will be obtained from the selected borrow area and will then be used to prepare mixtures representative of slurry wall backfill.

The gradation of the soil mixture will be determined and sufficient amounts of dry bentonite and bentonite slurry will be added to the soil to achieve the target permeability of  $1 \times 10^{-7}$  cm/sec and the desired backfill consistency. The amount of bentonite required will depend on the amount of fines in the soil mixture as determined by grain size analysis (see Figure 2-4).

#### 2.1.4.3 Task 3 - Ground Water Sample Collection

Prior to initiating compatibility testing of the soil-bentonite backfill, site ground water representative of "worst-case" conditions will be collected. The RI data indicate that monitoring well MW-7S had the highest concentrations of organic compounds in both sampling events. Therefore, water from MW-7S will be used as the permeant for compatibility testing.

Ground water from well MW-7S will be collected in five 4-liter amber bottles for use as permeant in the compatibility testing. Well MW-7S will initially be purged of three well volumes using a pre-cleaned Teflon bailer with stainless-steel cord. The amber bottles will then be filled directly from the bailers using Teflon bottom emptiers. Each sample bottle will be labeled and placed immediately in a cooler. Ice will be added to maintain the interior cooler temperature at four degrees Celsius. Samples will then be shipped to the geotechnical laboratory performing the compatibility testing.

In addition to the foregoing, one composite groundwater sample from all seven shallow wells (MW-1S, MW-2S, MW-3S, MW-4S, MW-5S, MW-6S and MW-7S) will be collected by Langan Environmental Services, Inc. for E.I. du Pont de Nemours & Co., Inc.'s (duPont's) screening and waste classification purposes. Each of the seven wells will be initially purged of three well volumes. The wells will be sampled in order of increasing levels of contamination (MW-6S MW-5S, MW-4S, MW-1S, MW-2S, MW-3S, and MW-7S) using a pre-cleaned and a Teflon or stainless-steel bailer. Decontamination of the bailer between wells will consist solely of a distilled deionized water rinse. A sample bottle will then be filled with approximately equal portions from each well. After the sample bottle is filled, the sample will be labeled, placed in a cooler with ice, and shipped via overnight carrier to the duPont facility in Deepwater, New Jersey. Analytical methods to be used by duPont will be appropriate for its needs with respect to furnishing approval for off-site treatment/disposal of ground water at its facility.

Water generated during the ground water sampling tasks (i.e., purge water and excess sampling water) will be discharged to the ground surface and diverted away from Peach Island Creek in accordance with the following procedures.

Generated material and waters will be managed/consolidated on-site, provided the following conditions are met:

1. Management/consolidation cannot cause or increase any existing threat to human health and the environment through any media exposure route.
2. Managed/consolidated material or water will not erode soil, flow off-site, flow onto uncontaminated areas on-site, or flow through contaminated areas into clean areas either on- or off-site.
3. Discharge of waters from a contaminated aquifer must not be allowed into an uncontaminated aquifer.

4. Management/consolidation of materials and/or discharge of waters on-site will be limited to areas of known contamination (at or above Action Levels for relevant pollutants) or an area as close to the origin of the material or water as possible.
5. Discharge should not significantly add to the contamination of surface soil.

If complying with the above prohibits waters or materials from being discharged directly upon generation, the waters will be collected, contained, analyzed, and securely stored until they can be properly disposed of elsewhere.

#### 2.1.4.4 Task 4 - Compatibility Testing

In order to determine the hydraulic conductivity of the soil-bentonite backfill, a two-step laboratory test will be performed. Initially, a soil-bentonite composite sample will be consolidated in a permeameter (at an effective pressure representative of the constructed slurry wall) and then permeated with de-aired water in order to determine the sample permeability. The sample will then be permeated with at least three pore volumes of site ground water representative of the "worst-case" water quality, based on the RI, to determine if site ground water causes an increase in slurry wall permeability. The hydraulic gradient and confining pressure will be controlled to prevent hydraulic fracture of the sample and to complete the test in the required time frame. This procedure will then be repeated using the "worst case" of brackish Peach Island Creek water or ground water which will be in contact with the outside bounds of the slurry wall. Further details of the test are provided in Section 2.3.4.

2.1.4.5 Task 5 - Data Evaluation and Reporting

The primary objective of data evaluation and reporting will be to develop design data required for the slurry wall and sheet pile design. All data generated in the above-described tasks will be presented in the Design Report. The contract for transportation and disposal of FOU water at the duPont facility, which will be received as a result of duPont's screening level tests of the composite ground water sample, will also be included in the Design Report or forwarded to the EPA when available. The geotechnical data deliverables will be in accordance with the requirements outlined in the ASTM Manual, Volume 4.08 for each method.

## 2.2 GEOTECHNICAL SAMPLING RATIONALE

Additional geotechnical data are needed for the slurry wall design, sheet pile design, and construction planning. This section describes the rationale for the specific sampling and testing required to obtain the data.

A total of 18 soil borings will be installed along the proposed slurry wall alignment (see Figure 2-3). The proposed boring spacing ranges from 100 feet to 150 feet.

To supplement the data obtained from visual classification and blow count information, geotechnical samples will be obtained from each of the FOU soil types (fill, peat and gray silt), as well as from the varved clay and the red clay layer for laboratory soil classification testing. This will include testing the samples for specific gravity, density, moisture content, grain size, and Atterberg limit properties.

As indicated on Figure 2-3, four borings will extend through the varved clay and/or red clay layer to determine the overall confining unit thickness. This information will be used to determine the slurry wall key depth and will also provide data for sheet pile design.

One sample each from the peat and silt soils will be collected and analyzed for consolidation. This information will be used to calculate potential consolidation which could occur due to the increase in effective stresses resulting from the dewatering process. This information is needed to assess potential effects on the integrity of the infiltration barrier and the slurry wall. The field engineer will be responsible for selecting representative samples from each boring. Those decisions will be based on visual classification of the samples and the boring logs. The field engineer will also designate samples from red clay and varved clay soil types for permeability and unconfined compressive strength tests. The permeability testing data will be used in water balance calculations. The confined compressive strength data will be used for the sheet piling final design.

## 2.3 GEOTECHNICAL SAMPLING EQUIPMENT AND TEST PROCEDURES

This section specifies the sampling equipment to be used and the procedures to be followed during the geotechnical boring program. As part of this program, field activities including surveying, drilling, and grouting will be performed. A detailed description of each of these activities is provided below.

### 2.3.1 Surveying

Prior to drilling, the proposed location of each borehole (as shown on Figure 2-3) will be surveyed for ground surface elevation and then staked. Minor adjustments to some of the proposed locations may be made due to access limitation or subsurface conditions. Following completion of the boring program, the actual locations of the boreholes will be surveyed. The designation of each boring along with its grid coordinates (plus/minus 1 foot) and vertical elevation (plus/minus 0.1 foot) will be recorded. For safety reasons, all utilities will be contacted for the locations of underground lines prior to drilling.

### 2.3.2 Drilling

During the boring program, boreholes will be advanced using a 3-1/2 inch hollow-stem auger or mud rotary drilling rig. The methods and equipment to be utilized for the boring program are outlined in Section 2.1.4.1.

Four of the boreholes will extend through the entire clay layer to the till aquifer to determine the average thickness of the clay layer. The four soil borings that will completely penetrate the clay layer will be advanced such that two split spoons beneath the clay are collected. The second spoon will either be advanced through the hole created by the first spoon, or a four-foot long spoon will be used. The borehole will be immediately tremie grouted from the bottom with cement-bentonite grout following collection of the last sample.

The designated Canonie engineer will log the soil samples during drilling in accordance with the USCS (ASTM D2487). The final logs will show both USCS and Burmister classifications. Observations of water level will be recorded. An Organic Vapor Analyzer detector will also be used to monitor volatile organic compounds (VOCs) in the cuttings. The Site specific Health and Safety Plan (HASP) contains further details to be followed.

Decontamination of the drilling rig using high-pressure steam will be performed before the rig enters the Site and when the rig leaves the Site. All downhole drilling equipment will be steam cleaned at each borehole prior to its use for starting a new borehole. This equipment includes drill rods, augers, and samplers. Decontamination water will be disposed of at the borehole by allowing it to flow to the ground, directed away from Peach Island Creek, and subject to the same conditions as those outlined in Section 2.1.4.3 regarding water generated during ground water sampling activities. Steam cleaning will provide an appropriate level of decontamination, since the samples being obtained are being used strictly for geotechnical testing. Cross-contamination from other boreholes is very unlikely, and would not affect the usability of the data in any case. No decontamination chemicals will be used, therefore there is no need to perform decontamination at the existing decontamination pad.

A steam cleaner will be used to remove any visible signs of grease, oil, or mud. A wire brush will be used, when necessary, to help remove any visible contamination. Any tools which come in contact with cuttings from the borehole, will be steam cleaned before they are used on any new borings. Split-spoon samples will be cleaned in a similar manner.

During the work on each borehole, the cuttings and ground water produced by the auger will be placed adjacent to the borehole and consolidated for placement under the infiltration barrier. The drill cuttings and ground water produced by the auger will be managed subject to the same conditions as those outlined in Section 2.1.4.3 regarding water generated during ground water sampling activities.

Personnel will wear cotton work gloves while handling cleaned drill rig equipment. The HASP describes any additional personnel protective measures needed.

#### 2.3.3 Backfilling/Grouting

All boreholes will be abandoned by backfilling to the ground surface with cement-bentonite grout placed by the tremie method. Grouting will be performed as augers are withdrawn and as soon as possible after drilling. The ground surface will then be restored to the approximate conditions that existed prior to drilling.

#### 2.3.4 Permeability and Compatibility Testing

The rationale for the backfill mix permeability and compatibility testing is presented in Section 2.1.4.2. Off-site soil samples to be utilized for the backfill mix design permeability and compatibility testing will be prepared by GSI using soils from the Mount Hope Quarry and bentonite provided by Canonie. The soils and bentonite will be obtained from the same sources that will act as suppliers throughout this project. The water provided to GSI will be obtained by Canonie from the public water system serving the Site, since this water will be used for preparation of the slurry during construction.

The mix design samples will be prepared by combining granular soil with dry bentonite and bentonite slurry. A total of six mix ratios will be tested. These will consist of the addition of bentonite, at 1, 2, and 3 percent by weight, to granular soil (Liza Common fill) and similar percentages of bentonite added to granular soil (Liza Common fill) with 20-percent clay soil added.

Permeability testing will be divided into three steps. Step 1 testing will be performed to determine the hydraulic conductivity of the soil using clean water as the permeant. Step 2 testing will be performed to determine the hydraulic conductivity using FOU ground water as the permeant. Step 3 testing will be performed to determine the hydraulic conductivity using the "worst case" of brackish Peach Island Creek water or ground water which will be in contact with the outside bounds of the slurry wall. Steps 2 and 3 test results will be used to evaluate the chemical compatibility of the soil/bentonite backfill with the respective permeants.

The laboratory determination of hydraulic conductivity of soil-bentonite mixtures will be performed using the modified triaxial compression apparatus technique. All specimens will initially be back-pressure saturated using de-aired water. The baseline hydraulic conductivity will be determined for constant head conditions using clean de-aired water.

The Step 1 hydraulic conductivity testing will determine the acceptability of the backfill mixture to meet the design specifications. Step 2 and Step 3 test results will confirm the compatibility of the soil/bentonite backfill with the "worst-case" FOU ground water and ground water in contact with the outside bounds of the slurry wall. The procedure for each step is described below.

#### Step 1

The specimen shall have a minimum diameter of 2.8 inches and shall have a minimum height of 2 inches. The sample will be placed in the triaxial cell and back-pressure saturated using de-aired tap water. After saturation is verified by checking the sample compressibility, the sample will be consolidated using a 10 pound per square inch (psi) effective stress. Pore pressures will be monitored to verify that primary consolidation is completed prior to initiation of the permeability test. The permeant liquid will then be forced through the sample from the bottom to the top using a hydraulic gradient of less than 60 feet per foot. The volume of flow will be monitored using a calibrated manometer system. The test will continue until the flow rate stabilizes.

### Step 2

Step 2 testing will be performed to confirm that the "worst-case" (i.e., high concentration) site ground water does not affect the hydraulic conductivity by interacting with the soil-bentonite structure. The "worst-case" site ground water will be obtained from monitoring well MW-7S based on the highest organic concentration reported in the RI Report. The ground water sample will be obtained as outlined in Section 2.1.4.3 and will not be de-aired for the compatibility testing. As this test is not performed to measure permeability, but rather to determine hydraulic conductivity changes influenced by permeant passing through the specimen, the specimen height, and hydraulic gradient can be varied to allow more expedient testing. One Step 2 test shall be performed for each soil/bentonite mixture tested in Step 1. Confirmatory testing may go on after the Remedial Design Report is finished.

The specimen used for Step 2 testing will have a minimum diameter of two inches and the sample height will be a minimum of two inches. The sample will be placed in the triaxial cell and back-pressure saturated using the de-aired permeant liquid. After saturation is verified, the specimen will be consolidated using a maximum effective stress of 10 psi. The permeant liquid will then be forced through the specimen from the bottom to the top using a hydraulic gradient of less than 150 feet per foot. The manometers will be read at least once every 24 hours with at least one reading every one-quarter pore volume. The test will continue until three pore volumes have passed through the sample.

### Step 3

Step 3 testing will be performed to confirm that the "worst case" of brackish Peach Island Creek water or ground water which will be in contact with the outside bounds of the slurry wall does not affect the hydraulic conductivity by interacting with the soil-bentonite structure. Step 3 testing will be performed using the same procedures as described in Step 2 above.

The test results will be plotted to indicate hydraulic conductivity versus pore volume. If the measured permeability is relatively constant with the number of pore volumes passed through the sample, then it will be concluded that the slurry wall will perform satisfactorily.

Test methods to be used for triaxial cell hydraulic conductivity testing are found in the EPA SW925 and Corps of Engineers, EM1110-2-1906, (November 1978).

The saturated hydraulic conductivity values are plotted as a function of the displaced pore volumes. Examination of the relationship between saturated hydraulic conductivity and pore volume displacement is the basis for determination of the compatibility of the soil/bentonite backfill and the on-site ground water.

#### 2.3.5 Geotechnical Testing Procedures

The following ASTM and other standard methods will be used for geotechnical sampling and analysis:

1. D2488; Practice for Description and Identification of Soils (Visual-Manual Procedure);
2. D2435; Test Methods for One-Dimensional Consolidation Properties of Soils;
3. D2487; Test Methods for Classification of Soils for Engineering Purposes;
4. D2607; Classification of Peats, Mosses, Humus, and related Products;
5. D2216; Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures;

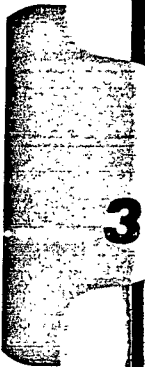
6. D1586; Method for Penetration Test and Split-Barrel Sampling of Soils;
7. D4220; Practices for Preserving and Transporting Soil Samples;
8. D1587; Practice for Thin-Walled Tube Sampling of Soils
9. United States Army Corps of Engineers Procedure for Permeability Testing of Clays, Triaxial Cell Hydraulic Conductivity Testing EM1110-2-1906, Appendix VII.
10. United States Environmental Protection Agency, SW925, Soil Properties Classification and Hydraulic Conductivity Testing.
11. D422; Method for Particulate Size Analysis of Soils.
12. D854; Test Method for Specific Gravity of Soils.
13. D2166; Test Method for Unconfined Compressive Strength of Cohesive Soil.
14. D4318; Test Method for Liquid Limit, Plasticity, Plasticity Index of Soils.

## 2.4 SCHEDULE

The soil boring field investigation will begin following the EPA's approval of this Remedial Design Work Plan. It is anticipated that this will be on or before April 5, 1991. The EPA and NJDEP require notification of the initiation of these field activities two weeks prior to their start. In a letter dated March 15, 1991, the Facility Coordinator Mr. Donald Murphy, Ph.D., P.E., of Langan Environmental Services, Inc., sent such notification indicating that field activities will begin on Monday, April 8, 1991. The soil boring program is expected to be completed in approximately two weeks. Geotechnical data required for the design will be available within four weeks after sampling. The collection of ground water for the geotechnical compatibility testing with prepared backfill soil samples will require no more than one day during the soil boring program. Collection of a composite ground water sample will require an additional day. Ground water sampling is scheduled for April 8 and 9, 1991. This sampling schedule has been coordinated with the overall project schedule which is described in Section 5.0.

## 2.5 HEALTH AND SAFETY

All geotechnical sampling will follow procedures outlined in the Site HASP to minimize health risks due to the contaminants contained in the soils. Air monitoring for health and safety will be conducted in accordance with the Site HASP.



SECTION 3

QUALITY ASSURANCE PROJECT PLAN  
FOR DESIGN ACTIVITIES  
MARCH 1991

TABLE OF CONTENTS

	<u>PAGE</u>
QUALITY ASSURANCE PROJECT PLAN	3-1

QUALITY ASSURANCE PROJECT PLAN  
FOR DESIGN ACTIVITIES

2

Since no environmental samples will be collected for chemical analysis during the design phase of the Interim Remedy, a standard remedial investigation-type Quality Assurance Project Plan (QAPjP) is not applicable to this Remedial Design Work Plan. The QAPjP as described in the "Region II CERCLA Quality Assurance Manual" (United States Environmental Protection Agency, Region II, March 1988) is designed to focus on quality control requirements for analytical sampling of matrices such as air, soil, and water. It typically defines the strict sample collection, chain-of-custody, and analytical procedures to be followed, as well as the rigorous laboratory controls required.

For the soil boring program described in Section 2.1.4, no analytical samples are required. Rather, the scope of work for the project is limited to the collection of geotechnical data for use in the Remedial Design Report. The quality control procedures for collection and testing of geotechnical samples is governed by the specific procedures outlined in the appropriate American Society for Testing and Materials (ASTMs) listed in Section 2.3.5. The ASTMs are recognized as the industry standard, and will be used to define the necessary geotechnical sample collection, testing, and quality control procedures for this project.

All sampling, handling, and testing of geotechnical samples will be performed in accordance with established ASTM procedures specified in the Sampling, Analysis, and Monitoring Plan for Design Activities (Section 2). These procedures will ensure that soil boring data will provide depth-to-clay and other geotechnical data useful for the slurry wall design.



SECTION 4

HEALTH AND SAFETY PLAN  
FOR DESIGN ACTIVITIES  
MARCH 1990

100264

**Canonie**Environmental

## TABLE OF CONTENTS

	<u>PAGE</u>
4.1 BASIS OF PLAN	4-1
4.1.1 Health and Safety Plan Acknowledgment	4-1
4.1.2 Training Requirements	4-1
4.1.3 Medical Monitoring Requirements	4-2
4.1.4 Fit Testing Requirements	4-2
4.2 ROLES AND RESPONSIBILITIES	4-3
4.2.1 Roles and Responsibility	4-3
4.2.2 Key Personnel	4-4
4.3 SITE BACKGROUND AND SCOPE OF WORK	4-5
4.3.1 Site Background	4-5
4.3.2 Scope of Work	4-5
4.4 TASK SAFETY AND HEALTH RISK ANALYSIS	4-6
4.4.1 Chemical Hazards	4-6
4.4.2 Activity-Specific Hazards and Standard Operating Procedures (SOPs)	4-6
4.4.2.1 Hazards and SOPs Associated with Soil Borings	4-6
4.4.2.2 Hazards and SOPs Associated with Ground Water Collection	4-8
4.4.3 General Site Hazards	4-8
4.5 PERSONAL PROTECTIVE EQUIPMENT	4-10
4.5.1 Level "D" Protection Use	4-10
4.5.1.1 Level "D" Protective Equipment	4-10
4.5.2 Level "C" Protection Use	4-11
4.5.2.1 Level "C" Protective Equipment	4-11
4.5.3 Level "B" Protection Use	4-12
4.5.3.1 Level "B" Protective Equipment	4-12

TABLE OF CONTENTS  
(Continued)

	<u>PAGE</u>
4.5.4 Activity-Specific Levels of Protection	4-13
4.6 AIR MONITORING AND ACTION LEVELS	4-14
4.6.1 General Air Monitoring Requirements	4-14
4.6.2 Work Area Monitoring	4-15
4.6.3 Perimeter Air Monitoring	4-15
4.6.4 Personnel Exposure	4-15
4.6.5 Documentation, Calibration, and Recordkeeping	4-16
4.7 SITE CONTROL AND STANDARD OPERATING PROCEDURES	4-17
4.7.1 Work Zones	4-17
4.7.1.1 Clean Zone/Support Zone	4-17
4.7.1.2 DECON Zone	4-17
4.7.1.3 Exclusion Zone/Hot Zone	4-18
4.7.2 General Field Safety and Standard Operating Procedures	4-18
4.8 DECON PROCEDURES	4-21
4.8.1 Procedures for Equipment DECON	4-21
4.8.2 Procedures for Personnel DECON	4-21
4.9 EMERGENCY RESPONSE CONTINGENCY PLAN	4-24
4.9.1 Emergency Contacts (Area Code 201)	4-24
4.9.2 Canonic Emergency Numbers	4-25
4.9.3 Emergency Equipment Available On-Site	4-25
4.9.4 Project Personnel Responsibilities During Emergencies	4-26
4.9.5 Medical Emergencies	4-28
4.9.6 Fire or Explosion	4-29
4.9.7 Spills or Leaks	4-29

TABLE OF CONTENTS  
(Continued)

	<u>PAGE</u>
4.9.8 Additional Site-Specific Procedures	4-29
4.9.9 Evacuation Routes and Resources	4-30
4.10 CONFINED SPACE ENTRY PROCEDURES	4-31

CANONIE ENVIRONMENTAL SERVICES CORP.  
SITE SAFETY PLAN

Date: March 15, 1991

Project Name: The Superfund Site at  
216 Paterson Plank Road  
Bergen County  
Carlstadt, New Jersey

Project Number: 90-198

Adopted By: \_\_\_\_\_ Date: \_\_\_\_\_  
Project Manager

Adopted By: \_\_\_\_\_ Date: \_\_\_\_\_  
Project Site Safety Officer

Adopted By: \_\_\_\_\_ Date: \_\_\_\_\_  
Regional Health and Safety Coordinator

This Health and Safety Plan has been prepared for the remedial design activities to be conducted at the Site by Canonie Environmental Services Corp.'s employees and its subcontractors. The on-site activities will include soil borings and ground water sampling. This plan does not cover future construction activities which may occur at the Site. Another Health and Safety Plan will be prepared for these activities as they are defined.

## HEALTH AND SAFETY PLAN FOR DESIGN ACTIVITIES

### 4.1 BASIS OF PLAN

This document describes the health and safety guidelines developed for the Site to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes. Where appropriate, specific Occupational Safety and Health Administration (OSHA) standards or other guidance are cited and applied. The procedures and guidelines contained herein were based upon the best available information at the time of the plan's preparation. Specific requirements will be revised if new information is received or conditions change. A written amendment, to be included in Appendix B, will be prepared to document all changes made to the plan.

#### 4.1.1 Health and Safety Plan Acknowledgment

The Canonie Environmental Service Corp. (Canonie) site safety officer (SSO) or designated representative shall be responsible for informing all individuals entering the exclusion zone or decontamination (DECON) zone of the contents of this plan and ensuring that each person signs the Safety Plan Acknowledgment Form. By signing the Safety Plan Acknowledgment Form, individuals are acknowledging the presence of specific hazards on-site and the policies and procedures required to minimize exposure or adverse effects of site hazards. The site safety plan acknowledgment form is located in Appendix E.

#### 4.1.2 Training Requirements

All personnel (including subcontractors and visitors) entering the exclusion zone or DECON zone (as defined in Section 4.7.1.2) must have completed training requirements for hazardous waste site work in accordance with OSHA 29 Code of Federal Regulations (CFR) 1910.120. Documentation of training requirements is the responsibility of each employer. However, written documentation verifying compliance with 29 CFR 1910.120 (e)(3), (e)(4) [as

applicable] and (e)(8) must be submitted to the SSO prior to entering the exclusion zone.

Site-specific training for those who will be entering the exclusion zone will be conducted prior to initiating field activities. Training will address emergency procedures, site control, and provisions of this Health and Safety Plan (HASP). The SSO is responsible for ensuring that all personnel receive the Site-specific training. The SSO will also conduct daily tailgate safety meetings to address current conditions at the Site.

#### 4.1.3 Medical Monitoring Requirements

All personnel (including subcontractors and visitors) entering the exclusion zone or DECON zone must have completed appropriate medical monitoring requirements required under OSHA 29 CFR 1910.120(f). Documentation of medical monitoring is the responsibility of each employer. However, written documentation verifying compliance must be submitted to the SSO prior to entry into the exclusion zone. Persons who are not required to complete OSHA 29 CFR 1910.120 medical monitoring must complete the Canonic training/medical monitoring waiver form prior to entering the exclusion zone.

#### 4.1.4 Fit Testing Requirements

All personnel (including visitors) entering the exclusion zone or DECON zone, where the potential exists to need a negative pressure respirator, must have successfully passed a qualitative respirator fit test in accordance with OSHA 29 CFR 1910.134 or American National Standards Institute (ANSI) Z88.2 within the last 12 months. Documentation of fit testing is the responsibility of each employer and must be submitted to the SSO prior to entering the exclusion zone and subsequent use of respiratory protection on-site.

## 4.2 ROLES AND RESPONSIBILITIES

### 4.2.1 Roles and Responsibility

SSO - The SSO, Rachelle Polley, is responsible for implementation of this plan, oversight of air monitoring programs on-site, and preparation of any written amendments to this plan. The SSO has the authority to shut down site operations if unsafe conditions are present. The SSO reports to the project engineer and the regional health and safety coordinator.

Project Manager - The project manager, Joseph Mihm, is responsible for approving the HASP for design activities.

Project Supervisor - The off-site project supervisor, Jerry Snyder, is responsible for oversight of all aspects of the project including health and safety and all on-site activities.

Project Engineer - The project engineer, Stephen Pierce, is responsible for on-site activities including sampling, quality assurance, and all on-site engineering activities. The project engineer also functions as the alternate SSO and reports directly to the project supervisor.

Regional Health and Safety Coordinator - The off-site regional health and safety coordinator, Clayton Bock, is responsible for the overall health and safety of personnel conducting work associated with this project. Any significant changes in site conditions/operations require a written amendment prepared by the SSO and authorized either verbally or in writing by the regional health and safety coordinator.

General Site Employees - All site employees are required to report all observations of unsafe conditions to their direct supervisor or to the SSO immediately.

As on-site operations develop, field conditions change and may raise questions regarding proper health and safety procedures. To ensure that the best technical health and safety information is provided, all health and safety issues are to be presented to the SSO and discussed between the SSO and the project engineer. If a solution is not identified, the operation in question must be discontinued and the regional health and safety coordinator (RHSC) must be consulted immediately.

4.2.2 Key Personnel

<u>Title</u>	<u>Name</u>	<u>Representing</u>
SSO	Rachelle Polley	Canonie
Project Manager	Joseph Mihm	Canonie
Project Supervisor	Jerry Snyder	Canonie
Project Engineer	Stephen Pierce	Canonie
RHSC	Clayton Bock	Canonie
Alternate SSO	Stephen Pierce	Canonie
Client Representative	Donald Murphy	Cooperating PRP Group as Facility Coordinator
Drilling Subcontractor	Dennis Anderson	Empire Soils Investigations, Inc.
Surveying Subcontractor	Andrew Marshall, Jr.	Andrew Marshall, Jr., P.E., L.S.

100272

#### 4.3 SITE BACKGROUND AND SCOPE OF WORK

##### 4.3.1 Site Background

The Site is a 5.9-acre site which is relatively flat and sparsely vegetated. The Site was operated from the 1940s through 1980 by North Jersey Refining Company, Scientific Chemical Treatment Company, and Scientific Chemical Processing, Inc. for the handling, treatment, and disposal of a wide variety of industrial and chemical wastes. In 1980, operations at the facility ceased. In 1983, the Site was placed on the National Priority List (NPL).

The Site is extremely complex because of the wide variety of contaminants present, the high concentrations of contaminants detected, and the potential migration routes for these contaminants. The data collected during the remedial investigation (RI) revealed that at least 87 chemicals exist in the soil and shallow ground water at the Site. Some of the chemicals detected in the soils and ground water at the Site are known human carcinogens (e.g., vinyl chloride, arsenic, benzene). Some others are known carcinogens (e.g., polychlorinated biphenyls (PCBs), chloroform, 1,2-dichloroethane (1,2-DCA), methylene chloride).

The chemicals identified at the Site present significant potential hazards to human health by way of inhalation, ingestion, and skin absorption.

##### 4.3.2 Scope of Work

Canonie intends to subcontract Empire Soils Investigations, Inc. to drill 18 or more soil borings at the perimeter of the Site. These soil borings will be used to confirm geotechnical information for the design of the remedial response. Canonie also intends to collect ground water from existing monitoring wells located at the Site and use the water in compatibility testing and in future slurry wall material permeability analysis.

No other on-site work is anticipated for this phase of the remedial design.

#### 4.4 TASK SAFETY AND HEALTH RISK ANALYSIS

This Hazard Assessment identifies the general hazards associated with specific site operations and presents an analysis of documented or potential chemical hazards that exist at the Site. Every effort must be made to reduce or eliminate these hazards. Those which cannot be eliminated must be guarded against by use of engineering controls and/or personal protective equipment.

##### 4.4.1 Chemical Hazards

Previous sampling and analytical data have indicated that 87 compounds have been identified at the Site. The characteristics of these compounds are listed in Table 4-1. Ground water and soil concentration information for these compounds is given in Appendix F. All routes of exposure (e.g., inhalation, ingestion, and skin absorption) must be protected during soil boring and ground water collection activities.

In accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200), material safety data sheets (MSDS) for all regulated chemical materials to be used during the conduct of site operations will be available from the SSO. MSDS training will be conducted in accordance with 29 CFR 1910.1200 and Canonie's Hazard Communication Program.

##### 4.4.2 Activity-Specific Hazards and Standard Operating Procedures (SOPs)

###### 4.4.2.1 Hazards and SOPs Associated with Soil Borings

Soil borings require the use of a drill rig.

Hazards: Physical injury and exposure to chemicals released from the borehole and spoils.

SOPs: The rig must be level prior to lifting the mast. All ropes, cables, hydraulic lines, and fluids on the rig must be checked daily. Personnel should locate themselves upwind of the bore-hole, whenever possible. Personnel must keep a safe distance from rotating augers, winches, etc. The drill rig must not be operated beneath or within 30 feet of overhead power lines. All underground utilities must be located prior to start of the job. The drill rig must not be operated in the presence of lightning. During boring, the contact area between the auger and the ground surface must be monitored for percent Lower Explosive Limit (LEL). If the percent LEL specified in Table 4-3 is reached, the auger must be stopped until the percent LEL is below the action level.

This operation will require Level "C" Personal Protective Equipment (PPE) (as described in Section 4.5) at all times if colorimetric detector tubes reveal vinyl chloride is not present and organic vapors, as determined by a Flame Ionization Detector (FID) or a Photoionization Detector (PID), are below 5 parts per million (ppm) as outlined in Section 4.5.2. If vinyl chloride is determined to be present by colorimetric detection tubes or if organic vapors exceed 5 ppm, Level "B" PPE is required. Level "D" PPE will not be used for soil boring activities.

Level D PPE will not be allowed for personnel in the exclusion zone during drilling operations because chemical constituents are present at the site that do not register on either a PID or an FID. These include metals, PCBs, and some semi-volatile compounds. Drilling operations could create dust and vapor emissions that would not register on a PID or FID. Level C PPE is the most reliable way to protect workers from potential exposure during drilling. Also, compounds such as benzene and nitrobenzene have threshold limit values (TLVs) of 1 ppm. Field conditions may reduce the reliability of PIDs and FIDs to detect low concentrations (i.e., 1 ppm) of these compounds.

#### 4.4.2.2 Hazards and SOPs Associated with Ground Water Collection

Hazard: Inhalation, ingestion, or dermal contact with contaminated material.

SOPs: Level "C" PPE must be utilized as described in Section 4.4.2 of this HASP. The employee breathing zone must be monitored during this activity with an FID or a PID. Colorimetric detector tubes must also be utilized for the detection of vinyl chloride. If vinyl chloride is present Level "B" PPE must be utilized as outlined in Section 4.4.3 of this HASP. If the FID or PID meter detects readings above 5 ppm for five minutes even without vinyl chloride present, Level "B" PPE must be utilized.

#### 4.4.3 General Site Hazards

Lighting - Work areas must have adequate lighting for employees to see to work and identify hazards. Personnel should carry flashlights in all normally dark areas for use in the event of a power failure. Applicable OSHA standards for lighting - 29 CFR 1910.120 (m) - shall apply.

Electrical Power - All electrical power must have a ground fault circuit interrupter as part of the circuit. All equipment must be suitable and approved for the class of hazard. Applicable OSHA standards for electrical - 29 CFR 1926 Subpart "K" shall apply.

High or Elevated Work - Elevated work where a fall potential exists will be performed using appropriate ladders and/or fall protection (i.e., body harness and lifeline).

Drum Handling - The movement and opening of drums will be done in accordance with 29 CFR 1910.120 (j).

Cold Stress - When the temperature falls below 40 degrees Fahrenheit, cold stress protocol shall be followed. Employees must be supplied with adequate clothing to maintain core temperature. Cold stress is discussed in detail in Appendix C.

Heat Stress - When the temperature exceeds 70 degrees Fahrenheit and personnel are wearing impermeable protective clothing, a heat stress monitoring program shall be implemented as appropriate. Employees shall have access to break periods and drinking water as necessary. Heat stress is discussed in detail in Appendix C.

Eye Wash Protection - All operations involving the potential for eye injury, splash, etc. must have approved eye wash units locally available as per 29 CFR 1910.151 (c).

Fire Protection/Fire Prevention - Operations involving the potential for fire hazards shall be conducted in a manner as to minimize the risk.

Utilities - Overhead and underground utility hazards shall be identified and/or inspected prior to conducting operations involving potential contact. The local utility companies shall also be contacted for specific permitting procedures.

#### 4.5 PERSONAL PROTECTIVE EQUIPMENT

The following is a brief description of the PPE which may be required during various phases of the project. The United States Environmental Protection Agency (EPA) terminology for protective equipment will be used: Levels "D", "C", and "B".

Respiratory protective equipment shall be National Institute for Occupational Safety and Health (NIOSH) -approved and use shall conform to OSHA 29 CFR Part 1910.134 requirements. Each employer shall maintain a written respirator program detailing selection, use, cleaning, maintenance, and storage of respiratory protective equipment.

##### 4.5.1 Level "D" Protection Use

Level "D" protection shall be used under the following conditions:

1. The atmosphere contains no known hazard;
2. Concentrations of airborne organic compounds do not exceed background;
3. Work functions preclude splashes, immersion in, unexpected inhalation of, or contact with hazardous concentrations of harmful chemicals.

##### 4.5.1.1 Level "D" Protective Equipment

Level "D" protection equipment shall consist of the following:

1. Chemical-resistant coveralls or standard work uniforms, as needed;
2. Steel-toe safety boots;
3. Gloves, as needed;

4. Safety glasses;
5. Splash shield, as needed;
6. Hard hat.

#### 4.5.2 Level "C" Protection Use

Level "C" protection shall be used under the following conditions:

1. Vinyl Chloride is not present in the employee breathing zone;
2. Concentrations of known airborne organics in the breathing zone are less than that identified by the SS0 with a ceiling of 5 ppm;
3. Air contaminants have been identified, concentrations measured, and an Air-Purifying Respirator (APR) is available that can remove the identified contaminants at the measured concentrations;
4. Measured substances have adequate warning properties so that someone wearing an APR respirator will smell the substance if breakthrough occurs.

#### 4.5.2.1 Level "C" Protective Equipment

Level "C" protective equipment shall consist of the following:

1. Polytyvek or saranex Tyvek coveralls;
2. Steel-toe safety boots;
3. Chemical-resistant outer boots or disposable boot covers;
4. Disposable, surgical, inner gloves;

5. Disposable, chemical-resistant gloves as determined by the SSO. During collection of ground water, Viton gloves will be worn;
6. Full-face APR with organic/high-efficiency particulate air (HEPA) cartridges;
7. Hard hat;
8. Cuffs sealed to boots or gloves.

#### 4.5.3 Level "B" Protection Use

Level "B" protection shall be used under the following conditions:

1. Vinyl chloride is present in the employee breathing zone.
2. Concentrations of chemicals in the air are immediately dangerous to life and health (IDLH), as listed in Table 4-1, or above the maximum use limit of an APR with full-face mask.
3. Oxygen deficient or potentially oxygen deficient atmospheres (less than 19.5 percent) are possible.
4. Concentrations of airborne organics exceed 5 ppm of known organics in the breathing zone.
5. Confined space entry requires Level "B".
6. The SSO requires Level "B".

#### 4.5.3.1 Level "B" Protective Equipment

Level "B" protective equipment shall consist of the following:

1. Polylaminated or saranex Tyvek coveralls;

2. Chemical-resistant boots or disposable boot covers;
3. Disposable, inner, surgical gloves;
4. Disposable, outer, chemical-resistant gloves, as determined by the SSO. During collection of ground water, Viton gloves will be worn;
5. Pressure-demand Self-Contained Breathing Apparatus (SCBA) or airline system with five-minute egress bottle;
6. Hard hat;
7. Clothing must be taped with duct tape at the ankles/wrists.

Note: Use of Level "B" personal protective equipment requires that one person be available as backup, ready to provide emergency assistance.

#### 4.5.4 Activity-Specific Levels of Protection

The required level of protection is specific to the activity being conducted and to the air monitoring data that are generated or anticipated (see Table 4-2). Only the RHSC or SSO can downgrade a level of protection.

#### 4.6 AIR MONITORING AND ACTION LEVELS

According to 29 CFR 1910.120 (h) air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on-site.

##### 4.6.1 General Air Monitoring Requirements

General air monitoring requirements are as follows:

1. Daily during operations, as outlined in Sections 4.6.2 and following, to document site conditions;
2. When the possibility of an IDLH condition or flammable atmosphere has developed;
3. When work begins on a different portion of the Site;
4. When contaminants other than those previously identified are being handled;
5. When a different type of operation is initiated;
6. When employees are handling leaking drums, containers, or working in areas with obvious contamination;
7. During confined space work;
8. When the SSO requires it.

Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

#### 4.6.2 Work Area Monitoring

The work area will be monitored with an Organic Vapor Analyzer [(OVA) FID] or an H-Nu (PID) every 15 minutes during soil boring or ground water collecting activities. Three times per day during activity on-site colorimetric detector tubes will be utilized for the identification of vinyl chloride. Action levels have been specified in Section 4.4.2.1 and 4.4.2.2. All measurements will be taken in the employee breathing zone and recorded as per Section 4.6.5 of this HASP.

During drilling, the borehole will be monitored every 10 minutes for percent LEL with a Combustible Gas Indicator/Oxygen (O<sub>2</sub>) Meter. Work must be stopped if 10 percent LEL is reached or an O<sub>2</sub> level below 19.5 percent occurs, as mandated by OSHA. A quick reference of this information is included in Table 4-3.

#### 4.6.3 Perimeter Air Monitoring

During on-site activities an employee will walk the perimeter of the Site three times per day with an OVA (FID) and/or H-Nu (PID). The results will be recorded as per Section 4.6.5 of this HASP. If 5 ppm above background is sustained for 5 minutes at the fence line, work will be halted until the source of the emission is located and controlled.

#### 4.6.4 Personnel Exposure

Personnel exposures will be assessed by the work area monitoring (Section 4.6.2) using the OVA (FID) or the H-Nu (PID) and colorimetric detector tubes.

#### 4.6.5 Documentation, Calibration, and Recordkeeping

All equipment will be calibrated daily according to the manufacturers' specifications. The OVA will be calibrated with a methane standard. The H-Nu will be calibrated with a isobutane standard (benzene comparison). The Explosimeter/O<sub>2</sub> Meter will be calibrated with pentane.

All air monitoring will be recorded daily including calibration settings, date, time, reading, work activity, approximate wind direction, location, instrument serial numbers, or Canonie's numbers and sampler's initials.

#### 4.7 SITE CONTROL AND STANDARD OPERATING PROCEDURES

##### 4.7.1 Work Zones

The primary purposes for site controls are to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. At the end of each workday, the Site will be secured to prevent unauthorized entry. Site work zones will include:

##### 4.7.1.1 Clean Zone/Support Zone

This uncontaminated support zone or clean zone will be the area outside the exclusion and DECON zones and within the geographic perimeters of the Site. This area is used for staging of clean materials, parking of vehicles, office and laboratory facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc. who will not necessarily be permitted in the exclusion zone. All personnel arriving in the support zone will, upon arrival, sign the Site entry/exit log. There will be one controlled entry/exit point from the clean zone to the DECON zone.

##### 4.7.1.2 DECON Zone

The DECON zone (shown on Figure 2-3) will provide a location for removal of contaminated personal protective equipment and final decontamination of personnel and equipment. All personnel and equipment must exit via the DECON area. A separate DECON area may be established for heavy equipment.

#### 4.7.1.3 Exclusion Zone/Hot Zone

The exclusion zone will be the "hot zone" or contaminated area inside the Site perimeter. Entry to and exit from this zone will be made through a designated point, and all personnel will be required to sign the hot zone entry/exit log located at the DECON area. Appropriate warning signs to identify the exclusion zone should be posted (e.g., "DANGER - AUTHORIZED PERSONNEL ONLY," "PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT," etc.). Exit from the exclusion zone must be accompanied by personnel and equipment DECON as described in Section 4.7. Note: All zones must be clearly separated to ensure that no one enters a zone unknowingly.

It should be noted that as work progresses, the Exclusion Zone may change or decrease in size. This determination shall be made by the SS0. All site personnel shall be informed of any changes.

A map of the work zones for this site is provided in Figure 2-3.

#### 4.7.2 General Field Safety and Standard Operating Procedures

1. It is our policy to practice administrative hazard control for all site areas by restricting entrance to exclusion zones to essential personnel and by using SOPs.
2. The "buddy system" will be used at all times by all field personnel in the hot zone. No one is to perform field work alone. Maintain visual, vocal, or radio communication at all times.
3. Whenever possible, avoid contact with contaminated (or potentially contaminated) surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel on the ground or set equipment on the ground. Stay away from any waste drums and tanks unless necessary. Protect equipment from contamination by bagging.

4. Eating, drinking, and smoking are permitted only in designated areas in the support zone, outside of active work areas.
5. Hands and face must be thoroughly washed upon leaving the DECON area.
6. Beards or other facial hair that interfere with respirator fit will not be permitted for persons required to use respiratory protection.
7. Contact lenses will not be permitted on-site.
8. All equipment must be DECONNED or discarded upon exit from the exclusion zone.
9. All personnel exiting the exclusion zone must go through the DECON procedures described in Section 4.7.
10. Personal protective equipment described in Section 4.4 will be required for all field personnel. Such equipment may include, but is not limited to, respiratory protection, earplugs, hard hat, rainsuits, boots, gloves, and safety glasses.
11. Anyone found to be under the influence of alcohol and/or illegal drugs shall be prohibited from working at the site and shall be subject to disciplinary action. Any employee under a physician's care and/or taking prescribed medication must notify the Site superintendent and the Site health and safety officer.
12. Changes in work practices or work rules shall be implemented only after a written safety plan amendment has been prepared and authorized.
13. Construction equipment always has the right-of-way over regular vehicles.

100287

14. All required protective clothing will be supplied by the designated SS0. None of this equipment will be permitted to leave the Site until the completion of the project.
15. Employees are responsible for cleaning and maintaining the protective equipment issued to them. Any noted defects in the equipment shall be reported immediately to the designated SS0.
16. Employees shall be alert to backup alarms on construction equipment and shall yield to construction equipment.
17. All equipment operators shall pay attention for personnel who may be in their path. Operators shall provide warning before moving.
18. All personnel shall follow emergency procedures outlined in this plan.
19. Personnel must report all injuries and/or illnesses to their supervisor. This includes minor or slight injuries and near misses.

#### 4.8 DECON PROCEDURES

In general, everything that enters the exclusion zone must either be decontaminated or properly discarded upon exit from the exclusion zone. All personnel, including visitors, must enter and exit the exclusion zone through the DECON area. Prior to demobilization, contaminated equipment will be decontaminated before it is moved into the clean zone. Any material that is generated by DECON procedures will be labelled and stored in a designated area in the exclusion zone until disposal arrangements are made.

Note: The type of DECON solution to be used is dependent on the type of chemical hazards. The DECON solution for this site is Alconox and water. DECON solution will be changed daily (at a minimum) and collected and stored on-site until disposal arrangements are finalized.

##### 4.8.1 Procedures for Equipment DECON

The drilling rig is the only anticipated piece of heavy equipment on-site. The drilling rig will be decontaminated with a pressure washer on a decontamination pad before leaving the site. The existing on-site decontamination pad will be utilized.

##### 4.8.2 Procedures for Personnel DECON

This DECON procedure applies to personnel at this site wearing Levels "B" and "C" protection. These are the minimum acceptable requirements:

##### Station 1: Equipment Drop

Deposit equipment used on-site (tools, sampling devices, monitoring instruments, radios, etc.) on plastic drop cloths. These items must be decontaminated or discarded as waste prior to removal from the exclusion zone.

Station 2: Outer Boot and Outer Glove Wash and Rinse

Scrub outer boots, outer gloves, and/or splash suit (if used) with DECON solution or detergent water. Rinse off with water.

Station 3: Outer Boot and Glove Removal

Remove outer boots and gloves. If outer boots are disposable, deposit in container with plastic liner. If nondisposable, store in a clean, dry place. Gloves are to be discarded daily.

Station 4: Tank Change (SCBA)/APR Cartridge Replacement

When a person leaves the exclusion zone to change an air tank or cartridges, this is the last step in the DECON procedure. The air tank or cartridge is exchanged, new outer gloves and boot covers donned, and cuffs taped before the person returns to the hot zone.

Station 5: Outer Garment Removal

If applicable, remove the SCBA back pack and remain on air as long as possible. Remove the chemical-resistant outer garments and deposit them in a container lined with plastic. Decontaminate or dispose of splash suits as necessary.

Station 6: Respiratory Protection Removal

Remove hard hat face-piece and, if applicable, deposit the SCBA on a clean surface. APR cartridges will be discarded as appropriate. Wash and rinse respiratory gear at least daily. Wipe off and store respiratory gear in a clean, dry location in the DECON zone.

Station 7: Inner Glove Removal

Remove inner gloves. Deposit in a container for disposal.

Station 8: Field Wash

Thoroughly wash hands and face with soap and water. Shower as soon as possible. The DECON area is designated in Figure 2-3.

#### 4.9 EMERGENCY RESPONSE CONTINGENCY PLAN

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms: illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. The following sections outline the general procedures for emergencies. Emergency information shall be posted as appropriate.

##### 4.9.1 Emergency Contacts (Area Code 201)

Fire: 438-4300

Police: 438-4300

Ambulance: 438-4300

Hospital: Meadowlands Hospital

Address: Meadowlands Parkway  
Secaucus, New Jersey

Telephone: 348-9300

Chemical Trauma Capabilities? Yes  
(for minor  
trauma)

Poison Control Center: (212) 764-7667

Directions from Site to Hospital (See Map in Appendix D):

From Gotham Parkway and Paterson Plank Road, turn left onto Paterson Plank Road. At the "Y" in the road take Route 3 East, toward the Lincoln Tunnel. Follow Route 3 across the Hackensack River Bridge. Stay in right lane. Follow blue signs with "H" on them. Take ramp at the end of the bridge and make a left-hand turn onto Meadowlands Parkway. Continue along this road for four traffic lights. The hospital is the fourth light on the right-hand side.

Note: Maps and directions to the hospital will be posted in the office, DECON trailers, and DECON area or as appropriate. At least one site representative must drive the route to the hospital to ensure familiarity and accuracy.

Distance from site to hospital is 2 miles. Approximate driving time is 7 minutes.

At least one person trained in first aid and Cardiovascular Pulmonary Resuscitation (CPR) will be on-site at all times. Names of medically trained persons will be posted on-site as appropriate.

#### 4.9.2 Canonie Emergency Numbers

SSO	Rachelle Polley	(215) 337-2551
Project Supervisor	Jerry Snyder	(215) 337-2551 (Work) (215) 631-5378 (Home)
Project Engineer	Stephen Pierce	(215) 337-2551 (Work) (215) 248-4775 (Home)
Regional Health and Safety Coordinator	Clayton Bock	(215) 337-2551 (Work) (609) 983-1618 (Home)
Corporate Health and Safety Manager	Tamara Renkoski	(219) 926-8651 (Work) (312) 248-3380 (Home)

#### 4.9.3 Emergency Equipment Available On-Site

Two 10-pound ABC dry chemical fire extinguishers;

One industrial size first aid kit;

One eye-wash station with at least a five-minute flushing capacity;

Level "B" PPE.

#### 4.9.4 Project Personnel Responsibilities During Emergencies

Prior to the start of site activities, the project engineer and the SSO will review the emergency procedures of this plan and ensure that all necessary emergency equipment is ready for use. When appropriate, they shall modify or make additions to the emergency procedures to enhance the effectiveness of the procedures.

The SSO and project engineer will also establish emergency evacuation routes and review potential emergencies and how they may occur. Together, the SSO and project engineer will address the containment and storage of hazardous materials, particularly liquids, and take measures to prevent leaks, spills, or accidents. Hazardous materials shall be properly stored and protected, including, but not limited to, protection from sun, heat, flames, water, and weather; isolation from personnel; segregation by hazard classifications; protection from vehicles, equipment, or traffic; posting of appropriate warning signs; and providing secondary containment as may be necessary.

The SSO will ensure that all personnel working on or visiting the Site are briefed on emergency procedures or warning devices and evacuation routes. On-site personnel will also be briefed on their roles in emergencies such as fire fighting, spill cleanup, and first aid.

In case of emergency, the project engineer will implement the Site emergency procedures. The project engineer will work in conjunction with the SSO. The project engineer is specifically responsible for the following:

1. Implementing the Site contingency plan, including ordering site evacuations, directing fire fighting efforts, and spill control and cleanup;

2. Contacting local emergency services such as the fire department, ambulance services, and federal, state, or local emergency or environmental agencies. The project engineer will coordinate with the local emergency services. In the event of an off-site release of toxic materials, local authorities must be informed immediately to assess the need for evacuation of the public in the vicinity of the Site. In the event of a spill where runoff may enter sanitary systems or drinking water supplies, local water and sanitation districts may need to be alerted;
3. Determining the cause of the incident and its prevention in the future;
4. Filing all necessary reports with federal, state, and local authorities and a complete written report to Canonie.

It should be noted that Canonie will not order or conduct evacuations of the general public. Canonie will make recommendations to the local emergency authority and assist in any way; however, the decision to call an evacuation will be up to the local agency in charge.

The SSO will work closely with the project engineer in the event of an emergency and will provide advice and support as necessary. The SSO will be responsible for the following:

1. Evaluating the emergency conditions and making recommendations regarding risks to off-site personnel and the public, the necessity of upgrading PPE to protect on-site personnel and emergency responders, and recommending evacuation of on-site personnel;
2. Supervising evacuation and decontamination procedures;
3. Providing first-aid services and medical support or evacuation for injured or exposed personnel;

4. Preparing a written incident report for submission to the Canonic Health and Safety Department.

Employees on-site are responsible for reporting emergency situations or conditions immediately to their supervisors, alerting other employees, helping injured personnel, and assisting as directed in the mitigation of the incident.

If the project engineer is absent or incapacitated, the SSO will assume the responsibility of the project engineer.

#### 4.9.5 Medical Emergencies

Seriously injured or ill personnel should not be moved until an assessment has been made by a person trained in first aid and CPR, unless their life is endangered.

Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full DECON should be completed and first aid administered prior to transport. If the person's condition is serious, at least partial DECON should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket). First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the SSO.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and information on the chemical(s) they may have been exposed to. This information is included in Table 4-1.

Any vehicle used to transport contaminated personnel will be cleaned or decontaminated as necessary.

#### 4.9.6 Fire or Explosion

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the SSO or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on-site.

If it is safe to do so, site personnel may do the following:

1. Use fire-fighting equipment available on-site;
2. Remove or isolate flammable or other hazardous materials which may contribute to the fire.

#### 4.9.7 Spills or Leaks

In the event of a spill or leak, site personnel will do the following:

1. Locate the source of the spillage and stop the flow if it can be done safely;
2. Begin containment and recovery of the spilled materials.

#### 4.9.8 Additional Site-Specific Procedures

There are no additional site-specific procedures because of the limited work activity in this phase of work.

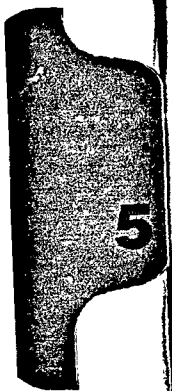
#### 4.9.9 Evacuation Routes and Resources

Evacuation routes have been established by work area locations for this site. Evacuation should be conducted immediately, without regard for equipment under conditions of extreme emergency. See site map for evacuation routes.

1. Evacuation notification will be a continuous blast on an air horn or vehicle horn or by verbal communication via radio.
2. Keep upwind of smoke, vapors, or spill location, if possible.
3. Exit through the DECON corridor, if possible.
4. If evacuation is not possible or feasible via the DECON corridor, site personnel should remove contaminated clothing once they are in a location of safety and leave it near the exclusion zone or in a safe place.
5. The SSO will conduct a head count to insure all personnel have been evacuated safely.
6. In the event that emergency site evacuation is necessary, all personnel are to:
  - o Escape the emergency situation;
  - o Decontaminate to the maximum extent practical;
  - o Meet at the office trailer.
7. In the event that the office trailer is no longer in a safe zone, meet at the bank across the street.

#### 4.10 CONFINED SPACE ENTRY PROCEDURES

During boring and ground water collecting, no confined spaces will be created.



100300

SECTION 5  
PROJECT SCHEDULE  
MARCH 1991

100301  
**Canonie** Environmen

## TABLE OF CONTENTS

	<u>PAGE</u>
5.1 INTRODUCTION	5-1
5.2 DESCRIPTION OF PROJECT SCHEDULE	5-2

100302

**Canonie**Environmental

## TABLE OF CONTENTS

	<u>PAGE</u>
5.1 INTRODUCTION	5-1
5.2 DESCRIPTION OF PROJECT SCHEDULE	5-2

100303

## 5.2 DESCRIPTION OF PROJECT SCHEDULE

The schedule for the preparation of the Remedial Design Work Plan and the Remedial Design Report is shown in Figure 5-1. The construction and O&M schedules are provided on Figures 5-2 and 5-3, respectively. A description of each schedule is also provided below.

Based on discussions on March 15, 18, and 19, 1991 with Mr. Pat Evangelista, Project Manager for the United States Environmental Protection Agency (EPA), the remainder of the remedial design schedule was revised to include the following conceptually anticipated schedule:

<u>Date</u>	<u>Milestone</u>
March 8, 1991	EPA/New Jersey Department of Environmental Protection (EPA/NJDEP) comments on the Remedial Design Work Plan were received.
March 22, 1991	A revised version of the Remedial Design Work Plan is to be forwarded to the EPA/NJDEP.
April 5, 1991	The EPA/NJDEP is to complete review of the revised Remedial Design Work Plan and authorize starting field work related to the Remedial Design Report.
April 8, 1991 (or 3 days after authorization to start field work, whichever is later).	Field activities in support of the Remedial Design Report will begin.

100304

May 20, 1991 (or 6 weeks after receipt of the EPA's approval the Remedial Design Work Plan).

The draft Remedial Design Report is to be forwarded to the EPA/NJDEP.

July 5, 1991 (or 7 weeks after receipt of the draft Remedial Design Report, whichever is later).

The EPA/NJDEP will furnish comments on the draft Remedial Design Report.

July 19, 1991 (or 2 weeks after receipt of the EPA/NJDEP comments on the draft Remedial Design Report, whichever is later).

The final Remedial Design Report is to be forwarded to the EPA/NJDEP.

August 2, 1991 (or 2 weeks after receipt of the final Remedial Design Report, whichever is later).

The EPA/NJDEP is to complete review of the final Remedial Design Report and approve start of construction.

August 5, 1991 (or 3 days after approval of the Remedial Design Report, whichever is later).

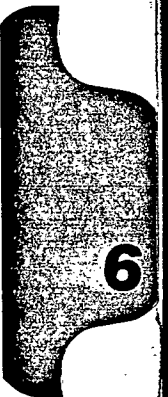
Canonie will begin mobilization for construction.

Construction of the Interim Remedy is expected to take 18 weeks from mobilization to demobilization. Figure 5-2 shows the draft construction schedule. The draft schedule for construction provides for 2-1/2 weeks for mobilization, 4-1/2 weeks for site preparation, 4 weeks for the slurry wall construction, 5 weeks for the installation of the infiltration barrier, 3 weeks for the installation of dewatering pumps, pipeline, and holding tank and startup of initial dewatering operation, and 2 weeks for demobilization. This schedule will allow completion of construction prior to the onset of cold-winter weather.

The draft O&M schedule involves continued dewatering of the Site and quarterly site maintenance for the first three years. The O&M activities are as follows:

1. Site inspection;
2. Erosion maintenance;
3. Quarterly surface and ground water sampling and analysis (by Langan Environmental Services, Inc.) in accordance with the procedures outlined in the Remedial Investigation Project Operations Plan;
4. Well/Fence Maintenance;
5. Continued Dewatering.

Details for each of these activities will be provided in the O&M Plan to be included in the Remedial Design Report.



SECTION 6

ACCESS AND APPROVALS PLAN  
FOR DESIGN ACTIVITIES  
MARCH 1991

## TABLE OF CONTENTS

	<u>PAGE</u>
6.1 INTRODUCTION	6-1
6.2 PERMITTING COMPLIANCE REQUIREMENTS	6-2
6.3 PROPERTY ACCESS PROCEDURES	6-4

100309

**Canonie**Environmental

## ACCESS AND APPROVALS PLAN FOR DESIGN ACTIVITIES

### 6.1 INTRODUCTION

Canonie Environmental Services Corp. (Canonie) has prepared this Access and Approvals Plan (AAP) for the Site Group. This plan has been prepared in general accordance with the requirements provided in Attachment 8 of the Administrative Order, effective October 18, 1990.

The purpose of this plan is to outline the steps required to obtain the access and other approvals needed to conduct the pre-design data collection activities at the Site.

Descriptions of the following sections are as follows:

- o Section 6.2 describes the permitting compliance requirements;
- o Section 6.3 identifies the procedures to be used to obtain approvals of access;

100310

## 6.2 PERMITTING COMPLIANCE REQUIREMENTS

All pre-design investigation activities will be conducted in compliance with federal, state, and local requirements and will be performed under the supervision of a Professional Engineer, registered geologist, or hydrogeologist. A list of permits and approvals which Canonie anticipates acquiring in preparation for the remedial design activities and a schedule for obtaining them is provided in Table 6-1.

Soil borings may be constructed or sealed only by a person possessing either a New Jersey Well Driller's License or New Jersey Boring Certification. An approved Monitoring Well Permit must be secured prior to the start of drilling operations. All borings less than 25-feet deep are exempt from permitting requirements. All borings, both permitted and non-permitted, are to be sealed in accordance with the New Jersey Department of Environmental Protection (NJDEP)-approved procedures. A completed Monitoring Well Record will be submitted to the NJDEP for any boring which has been issued a Permit Number. Upon sealing the boring, the driller will submit a completed Well Abandonment Report for any boring which has been issued a Permit Number.

No off-site disposal, transfer, storage, or treatment of hazardous substances is anticipated during the pre-design data collection activities. However, should such activities be required, they will be conducted in compliance with the applicable Resource Conservation and Recovery Act (RCRA) regulations and the United States Environmental Protection Agency (EPA) Guidance (EPA, November 13, 1989). Residuals, consisting of drill cuttings, drums and containers, and protective clothing waste, remaining on-site will be managed in accordance with applicable federal, state, and

local regulations. Proposed residual materials handling protocols during the pre-design investigation are as follows:

1. Equipment decontamination water generated from deionized water rinsing of bailers and water generated from well purging will be discharged to the ground surface and diverted away from Peach Island Creek;
2. Drill cuttings will be collected adjacent to the borehole and consolidated for placement under the infiltration barrier;
3. Health and safety equipment waste (including personal protective equipment) will be containerized and left on-site until after completion of the Interim Remedy, at which time it will be properly disposed of off-site;
4. Non-contaminated material brought on-site by Canonie or its subcontractors will be transported off-site and disposed of at a permitted local municipal landfill.

The residual materials produced during design activities will be managed subject to the same conditions as those outlined in Section 2.1.4.3 regarding water generated during ground water sampling activities.

No off-site disposal, except for non-contaminated material brought on-site by Canonie or its subcontractors, is anticipated for the remedial design activities.

### 6.3 PROPERTY ACCESS PROCEDURES

Access to the Site property will be required for the duration of the remedial design field activities. Written access approval has been requested of the Site owner via a letter. A copy of the response letter granting access is included as Appendix G of this plan.

Access to off-site property is not required for the remedial design activities.



7

SECTION 7

PRELIMINARY REMEDIAL DESIGN REPORT  
MARCH 1991

100315

**Canonie**Environmental

## TABLE OF CONTENTS

	<u>PAGE</u>
7.1 INTRODUCTION	7-1
7.1.1 Interim Remedy Description	7-1
7.1.2 Interim Remedy Objective	7-1
7.1.3 Report Contents and Objectives	7-2
7.2 SLURRY WALL DESIGN	7-4
7.2.1 Design Alternatives	7-4
7.2.2 Design Requirements	7-5
7.2.2.1 Depth	7-5
7.2.2.2 Width	7-5
7.2.2.3 Permeability and Compatibility	7-6
7.2.2.4 Alignment	7-6
7.2.2.5 Flexible Membrane Liner	7-7
7.2.3 Construction Methods	7-7
7.2.4 Excess Slurry Consolidation	7-8
7.2.5 Volatile Organic Compound Emission	7-8
7.2.6 Data Requirements	7-9
7.2.6.1 Geotechnical Testing of Subsurface Soils	7-10
7.2.6.2 Geotechnical Testing of Soil/Bentonite Backfill	7-10
7.2.6.3 Physical and Chemical-Resistance Properties of HDPE Membrane	7-11
7.3 BANK SLOPE SUPPORT	7-12
7.4 INFILTRATION BARRIER DESIGN	7-13
7.4.1 Design Requirements	7-13

TABLE OF CONTENTS  
(Continued)

	<u>PAGE</u>
7.4.2 Proposed Infiltration Barrier	7-14
7.4.2.1 Regrading of Fill Unit	7-14
7.4.2.2 Geotextile Cushion Layer	7-14
7.4.2.3 A 60-Mil High Density Polyethylene Membrane	7-15
7.4.2.4 Membrane Weighting System	7-15
7.4.3 Construction Sequence	7-16
7.4.4 Data Requirements	7-16
7.5 DEWATERING DESIGN	7-17
7.5.1 Design Basis	7-17
7.5.2 Drainable Ground Water Volume Estimate	7-18
7.5.3 Dewatering Performance Analysis	7-19
7.5.4 Holding Tank	7-20
7.5.5 Data Requirements	7-20
7.6 CONSTRUCTION OPERATION PLAN	7-21
7.6.1 Site Preparation	7-21
7.6.2 Construction Sequence	7-22
7.6.3 Site Security and Maintenance	7-23

## PRELIMINARY REMEDIAL DESIGN REPORT

### 7.1 INTRODUCTION

#### 7.1.1 Interim Remedy Description

The Record of Decision (ROD) for the Site selected an Interim Remedy consisting of the following activities:

1. Install a perimeter slurry wall;
2. Install and operate a ground water extraction system;
3. Transport extracted water to an off-site treatment facility;
4. Treat and dispose of extracted water at the off-site treatment facility;
5. Install an infiltration barrier over the fill to minimize rain-water infiltration;
6. Operate and maintain the ground water extraction system, infiltration barrier, and slurry wall;
7. Maintain the fence and site security;
8. Implement a surface water and ground water monitoring program.

#### 7.1.2 Interim Remedy Objective

The objective of the Site Interim Remedy is to reduce contaminant migration from the Site until a permanent remedy is implemented. Current contaminant migration occurs via three primary pathways:

1. Site ground water discharge to Peach Island Creek;
2. Site surface water runoff and sediment migration to Peach Island Creek;

100318

3. Vertical migration of contamination into the deeper aquifer system.

The Interim Remedy is intended to control these three pathways. In addition, the Interim Remedy will alleviate other potential risks, such as direct contact with the exposed site soils, wind erosion of site soils, and vapor emission.

7.1.3 Report Contents and Objectives

The key design components of the Interim Remedy are a perimeter slurry wall, a ground water extraction system, and an infiltration barrier. This Preliminary Remedial Design Report presents a preliminary level design for these key components. The contents of this report include the design requirements, design alternatives evaluation, design rationale and analysis, conceptual design drawings, and construction methods and sequence.

Because of the preliminary and conceptual nature of this report as part of the Work Plan, this report relies on design parameters based on assumptions or qualitative estimates from a review of the existing data. Additional geotechnical data will be secured during the design phase. The design data will be refined during the design phase by in-depth reviews of the existing data, collection of additional field and laboratory data, estimated values from similar projects, and assumed values based on literature. As a result, the key design features presented in this report may be modified during the design process.

Canonie Environmental Services Corp. (Canonie) has defined the objectives of this preliminary Remedial Design Report as follows:

1. To present an overview of the key design features and design alternatives for the United States Environmental Protection Agency's (EPA's) review toward development of a design framework before initiating the detailed design;

100319

2. To identify additional data needs to finalize the design and the methods of developing these data as part of detailed design effort.

## 7.2 SLURRY WALL DESIGN

### 7.2.1 Design Alternatives

Both soil/bentonite and cement/bentonite backfill mixtures were considered for use in the design of the slurry wall for this project. A soil/bentonite backfill is recommended for the reasons outlined below:

1. Plasticity - The completed slurry wall should be flexible or plastic to conform to lateral earth pressures, settlements, and other earth movements. The subsurface information presented in the Remedial Investigation (RI) Report indicates that a peat layer on the order of one- to seven-feet thick is present below the fill. The peat is underlain by a soft silt unit. Dewatering of the shallow aquifer will cause an increase in the effective stresses acting on the peat, silt, and clay layers. The increased effective stresses may in turn cause settlements in these materials, especially the peat. Soil/bentonite walls can maintain their integrity by adjusting to settlements and other earth movements due to their plasticity. Cement/bentonite walls are much more brittle than soil/bentonite walls, therefore shifts in nearby strata may cause cracking in cement/bentonite walls.
2. Structural Support - The primary advantage of a cement-bentonite wall is its structural support capability such as vertical load bearing or retaining lateral earth pressure. The slurry wall at the Site will require a high-density polyethylene (HDPE) membrane placed at the center of the trench. Positioning of the membrane at the center is to prevent damage of the membrane from construction debris in the fill if it were positioned against one of the trench sidewalls. However, this centered membrane produces a discontinuity in the wall structure, thereby reducing the advantage of a cement-bentonite wall as a rigid structural support.

3. Flexible Membrane Liner Installation - A soil/bentonite wall can accommodate various flexible membrane liner (FML) installation methods better than a cement-bentonite wall.

#### 7.2.2 Design Requirements

The major dimensional and physical aspects of the slurry wall which must be determined during the design phase are discussed in the following sections:

- o Section 7.2.2.1 - Depth;
- o Section 7.2.2.2 - Width;
- o Section 7.2.2.3 - Permeability and Compatibility;
- o Section 7.2.2.4 - Alignment;
- o Section 7.2.2.5 - Flexible Membrane Liner.

##### 7.2.2.1 Depth

To determine the depth of the slurry wall, a boring program will be conducted along the expected alignment of the slurry wall. The slurry wall boring program will involve 18 soil borings to locate the top of the clay layer. Based on the subsurface data presented in the RI, it is anticipated that the slurry wall will be keyed into the massive red clay or varved clay present approximately 12 to 14 feet below the ground surface. Assuming a 2-foot-thick key into the clay, the total depth of the slurry wall would be 14 to 16 feet.

##### 7.2.2.2 Width

The width of the slurry wall will be determined by the construction equipment used for trench excavation, as well as the need to accommodate FML installation equipment. Canonie anticipates utilizing a relatively light excavator (e.g., Caterpillar 225B class) with a standard trenching bucket

and side bits. This equipment will provide a trench width of approximately 36 inches.

#### 7.2.2.3 Permeability and Compatibility

The permeability of the backfill is the most important performance requirement for the slurry wall design. Canonie will obtain soil samples from off-site borrow sources that will be identified during the design phase. These soil samples will be mixed with various percentages of commercially available bentonite. For adequate migration control, it is desirable to achieve a hydraulic conductivity of the soil/bentonite backfill less than  $1 \times 10^{-7}$  centimeters per second (cm/sec) (EPA, 1984). Permeability testing of the soil/bentonite mixes will be performed to determine the most desirable backfill mixture to achieve a saturated hydraulic conductivity of  $1 \times 10^{-7}$  cm/sec or less.

The soil/bentonite backfill will be evaluated for compatibility with the "worst-case" FOU ground water and ground water in contact with the outside bounds of the slurry wall. The saturated hydraulic conductivity obtained during the compatibility analysis must still be less than  $1 \times 10^{-7}$  cm/sec. A more detailed discussion of the proposed geotechnical testing program for this project is presented in the Sampling, Analysis, and Monitoring Plan (SAMP).

#### 7.2.2.4 Alignment

The slurry wall will be aligned as close to the boundaries of the Site as possible to achieve maximum containment of the shallow aquifer. A preliminary slurry wall layout is shown on Figure 2-2. This alignment reflects the maximum extent of containment considering the property line, sewer easement, and access limitations along the creek bank.

#### 7.2.2.5 Flexible Membrane Liner

The slurry wall system at this Site will be upgraded using a FML to be placed along the centerline of the slurry wall (Figure 7-1). The FML will be a 60-mil HDPE sheet with tongue-and-groove interlocks. These interlocking HDPE sheets are manufactured under the product name of Gundwall by Gundle Lining Systems, Inc. (Gundle), Houston, Texas. Gundle has performed compatibility testing of HDPE with many contaminants of various concentrations and compositions. The manufacturer's compatibility data will be provided with the Remedial Design Report. Figure 7-2 provides a cross-section of the Gundwall sheeting system installed in a slurry wall. The chemical compatibility of the expansion seal will be evaluated during the remedial design. The Gundwall barrier wall system has been installed and is functioning successfully on several projects in Holland and is expected to be suitable for use at the Site. The Remedial Design Report will provide for the development of a second liner design and installation method as a contingency measure if it is determined during the remedial design that there is substantial risk remaining for installation of the Gundwall system.

#### 7.2.3 Construction Methods

In general, the construction of the "upgraded" slurry wall surrounding the shallow aquifer may be significantly different from typical slurry wall installation practices. The installation method for the Gundwall system is outlined below:

1. Excavate a trench section and pump slurry into the trench to maintain the slurry level near the ground surface as trench excavation continues;
2. Backfill trench with soil/bentonite backfill, maintaining toe of backfill behind the excavation;
3. Vibrate a frame, with a Gundwall sheet, through the backfill to the bottom of the trench;

4. Vibrate another frame with the next sheet, interlocking the two sheets;
5. Extract the previous frame and continue placement of sheets by alternating placement of the frames next to each other.

A perimeter access road will be provided, if and where needed, to facilitate installation of the slurry wall.

#### 7.2.4 Excess Slurry Consolidation

Canonie will sequence trench excavation in a manner which facilitates the most efficient recycling of slurry. The work will be managed to minimize the amount of slurry left at the end of construction of the slurry wall. Any excess slurry at the end of the slurry wall installation, which has been circulated through the trench, will be consolidated for placement under the infiltration barrier. Such excess slurry consolidation will be subject to the same conditions as those outlined in Section 2.1.4.3 regarding water generated during ground water sampling activities. To limit the potential for settlement in the final slurry-consolidation area, the excess slurry will be mixed with soils from the trench. This will be performed prior to construction of the infiltration barrier. Other slurry materials, which have not been mixed or in contact with the site materials, will be taken off-site at the end of construction.

#### 7.2.5 Volatile Organic Compound Emission

Some volatile organic compound (VOC) emissions are expected from the site soils when soils are disturbed during excavation or regrading. Emissions from the slurry trench are expected to be minimal because the trench will be full of bentonite slurry during excavation. Emissions from the excavated soil will not be significant because of the slurry coating on the soil surface. Regrading of the trenching soil may create VOC emissions which may require control measures. To address this VOC emission issue,

Canonie will perform the following tasks during the design and construction:

1. Establish acceptable boundary VOC levels based on the relevant health protection standards and the state air quality requirements;
2. Estimate probable VOC emission levels based on the existing RI data and dispersion modeling;
3. Establish various action levels for VOC emissions and develop VOC emission control measures corresponding to these action levels;
4. Monitor VOC emission during construction activities and implement appropriate control measures when required.

The emission control measures may include, depending on the nature of construction activities, spraying foam or bentonite slurry, adjusting the rate of work, and scheduling certain activities to avoid potential exposures. Further details of control measures will be developed during the design.

#### 7.2.6 Data Requirements

The data required for the slurry wall design and construction includes:

1. Subsurface stratigraphy to confirm the presence of and depth to the clay layer;
2. Geotechnical properties of the soil/bentonite backfill materials;
3. Physical and chemical properties of the HDPE membrane utilized at the center of the slurry wall.

The subsurface conditions will be investigated with soil borings along the slurry wall alignment. Figure 2-3 presents number and location of the soil borings. Continuous split-spoon samples will be collected throughout the soil boring program, with appropriate samples submitted for geotechnical testing. Shelby tube samples will also be collected for silt and clay samples. The types and minimum number of geotechnical tests to be performed are described in Section 2.1.4. The following sections provide a brief overview of the geotechnical testing program as it pertains to the slurry wall design and construction.

#### 7.2.6.1 Geotechnical Testing of Subsurface Soils

The soil samples and soil borings will be used to obtain the following general geotechnical properties and interpretation of the subsurface conditions:

1. Strata thickness;
2. Moisture content and density;
3. Visual and laboratory classification of materials encountered, with particular emphasis placed on the silt/clay interface;
4. Standard penetration test blow counts;
5. Permeability of the varved/red clay layer;
6. Consolidation characteristics of the silt and peat layers.

#### 7.2.6.2 Geotechnical Testing of Soil/Bentonite Backfill

The imported fill and bentonite materials to be utilized for the slurry wall backfill will require the following laboratory testing:

1. Gradation of imported fill (sieve and hydrometer analysis);

2. Laboratory classification of imported fill;
3. Permeability of soil/bentonite backfill for the selected mix designs;
4. Compatibility of soil/bentonite backfill mix with site ground water.

7.2.6.3 Physical and Chemical-Resistance Properties of HDPE Membrane

All physical and chemical-resistance information pertaining to HDPE sheet will be obtained from the manufacturers' literature.

### 7.3 BANK SLOPE SUPPORT

The bank along Peach Island Creek is relatively steep and 6 to 10 feet high. Along the creek bank, the objective is to install the slurry wall as close to the creek as practicable. This will provide for maximum containment of the site soils. The remedial design will consider the following alternatives for constructing the slurry wall along the edge of Peach Island Creek:

1. Installing the slurry wall without any special bank support features;
2. Installing steel sheet piling along the edge of the creek to support the bank during construction. See Figure 7-5;
3. Creating a temporary lowered working bench along the lowered working edge of the creek. See Figure 7-6.

The benefits and risks of each of these alternatives will be evaluated along with their associated costs to identify the optimum method for installing the slurry wall along Peach Island Creek. The Remedial Design Report will present the results of this evaluation.

#### 7.4 INFILTRATION BARRIER DESIGN

This section provides a description of the design requirements, preliminary profile, and construction procedures which are relevant to the design and installation of the infiltration barrier on the Site.

##### 7.4.1 Design Requirements

The primary purpose of the infiltration barrier at the Site is to minimize infiltration. Secondary purposes of this infiltration barrier include:

1. Prevent direct contact with the Site soil and control vapor emissions from the Site;
2. Minimize erosion of Site soils by surface water or wind.

The infiltration barrier will be designed to meet the following requirements:

1. Minimize surface water infiltration with a barrier layer;
2. Allow free surface drainage;
3. Minimize operation/maintenance costs;
4. Allow for settlement of subsurface soils.

Each of these considerations is discussed in the following sections.

#### 7.4.2 Proposed Infiltration Barrier

The proposed infiltration barrier cross section is shown on Figure 7-4. It will consist of the following components from the existing ground surface to the top of the infiltration barrier:

1. A geotextile cushion layer, the thickness of which will be determined during the remedial design;
2. A 60-mil HDPE membrane;
3. A membrane weighting system.

The purpose of each of these elements in the proposed section is discussed in the following sections.

##### 7.4.2.1 Regrading of Fill Unit

The soils immediately below the non-woven geotextile will be shaped and rolled. A steel-drum roller will be used to achieve a relatively smooth subgrade surface.

##### 7.4.2.2 Geotextile Cushion Layer

A non-woven type geotextile cushion layer will be placed on the ground surface to prepare it for the HDPE membrane. This layer will function primarily to provide a protective subgrade for the placement of the HDPE membrane. Without this layer, the HDPE membrane would be more susceptible to potential damage when pressed against coarse-grained fill-unit soils under earthwork equipment.

#### 7.4.2.3 A 60-Mil High Density Polyethylene Membrane

The 60-mil HDPE membrane will be placed on the geotextile and will:

1. Prevent rain water infiltration in the fill unit;
2. Maintain its properties in the event of settlement of subsurface soils.

HDPE membranes are known to have:

1. High resistance to degradation from chemicals;
2. High physical strength;
3. Excellent survivability characteristics during field construction.

Construction of HDPE membrane is common practice.

#### 7.4.2.4 Membrane Weighting System

To prevent displacement or unwanted movement of the HDPE membrane, a membrane weighting system will be placed on top of the infiltration barrier. Placement of this system will occur while the membrane is being placed on the geotextile material. At present it is anticipated that the membrane weighting system will consist of masonry blocks, sand bags, or some other type of simple units placed in a checkered pattern over the infiltration barrier. The type of units, the size of units, the spacing of units, and other design details will be developed and provided in the Remedial Design Report.

#### 7.4.3 Construction Sequence

A detailed construction sequence for the infiltration barrier will be developed during design. The entire area bounded by the slurry wall will be covered with the infiltration barrier.

#### 7.4.4 Data Requirements

Construction of an infiltration barrier as a remedial measure for waste sites is a routine practice. Sufficient design data from literature and manufacturer's specifications exists for a 60-mil HDPE membrane.

## 7.5 DEWATERING DESIGN

The dewatering system will be installed after completion of the infiltration barrier. After installation, the dewatering system will be tested to assure proper operation and then put into operation. Dewatering is expected to begin in early mid-December 1991 based on the construction schedule shown on Figure 5-2. The objective of dewatering is to lower the First Operable Unit (FOU) ground water to the lowest practicable level, which is the top of the peat layer (i.e., the bottom of the fill layer).

Provisions for monitoring water levels inside and outside the confines of the slurry wall will be discussed in the forthcoming Operations and Maintenance (O&M) Plan. The O&M Plan will also discuss methods for monitoring ground water quality outside the FOU. Ground water quality within the FOU will not be monitored as this water will be removed and transported to E.I. du Pont de Nemours & Co., Inc. for treatment and disposal off-site.

### 7.5.1 Design Basis

Seven existing monitoring wells will be used to dewater the shallow aquifer. Additional dewatering wells may have to be installed if the performance of the existing monitoring wells is not adequate for site dewatering. This section presents the dewatering performance of these wells for the given site conditions and the other design requirements such as the holding tank, piping, and pump requirements.

The performance of the dewatering wells will be based on the following subsurface conditions as identified in the RI Report:

1. Fill Unit - Six- to eight-feet thick, heterogeneous fill consisting of various soils, construction/demolition rubble, and other debris. Water table about 2 feet below the ground surface, hydraulic conductivity between  $1 \times 10^{-2}$  to  $1 \times 10^{-4}$  cm/sec.

2. Peat Unit - One- to seven-feet thick with hydraulic conductivity of approximately  $1 \times 10^{-2}$  cm/sec.
3. Silt Unit - Two- to three-feet thick with hydraulic conductivity of approximately  $1 \times 10^{-6}$  cm/sec.

For the purpose of estimating the well yield, a combined thickness of 10 feet was used for the fill and peat units. In addition, it was assumed that the ground water table will be lowered by six feet (to the bottom of the fill unit, which is considered to be the lowest practicable level). This is consistent with the EPA's ROD.

#### 7.5.2 Drainable Ground Water Volume Estimate

The total volume of drainable water can be estimated using the following data:

1. Total fill area enclosed by the slurry wall: 5.5 acres;
2. Saturated fill/peat thickness before dewatering: 8 feet;
3. Saturated fill/peat thickness after dewatering: 3 feet;
4. Assumed porosity of the fill material: 0.3;
5. Assumed drainable porosity (or specific yield): A low value of 0.10 to a high value of 0.16.

Then, the total volume of drainable water is:

5.5 acres x 43,560 square foot/acre x 6 feet x (0.10 to 0.16) x 7.48 gallons/cubic foot = 1,075,000 to 1,720,000 gallons.

Taking the average of the estimated range and considering the declining saturated thickness toward Peach Island Creek, leads to the selection of one million gallons as the single number estimate for the purpose of design analysis.

After initial dewatering, the recharge through the slurry wall and the infiltration barrier is expected to be negligible and no vertical flows from the till aquifer are expected. However, a sustained low yield (e.g., lower than one gallon per minute) would continue due to slow, delayed draining of the unsaturated zone created after initial dewatering. Since the recharge is negligible, the total volume to be removed from the shallow aquifer would be identical to the total drainable volume of about one-million gallons.

#### 7.5.3 Dewatering Performance Analysis

The objective of dewatering is to dewater the FOU to the extent practicable. The FOU ground water will be lowered to the bottom of the fill layer, which is the lowest practicable level during dewatering operations.

The typical construction of seven shallow monitoring wells to be used for shallow aquifer dewatering is shown on Figure 7-4. The wells are 12-feet deep, screened over the entire length with 4-inch-diameter well screens made of stainless steel, and installed in 8-inch-diameter borings. Based on the analysis presented in Appendix H, the seven existing monitoring wells can achieve removal of about 400,000 gallons of water within 3 months. The remainder of the drainable water can be drained within two years after initial dewatering.

Assuming a 5,000-gallon capacity tanker truck, the hauling rate of extracted water will be more than one tanker trip a day during the first two months, one trip every two days for the next five months, and one trip every four days during the following five months. During the second year, the tanker operation would be about one trip a week.

#### 7.5.4 Holding Tank

The water from each extraction well will be pumped to an on-site holding tank. The holding tank would have an unloading system associated with it to facilitate loading tanker trucks. The holding tank capacity should be sufficient to load tanker trucks at the initial stage of dewatering when the trip frequency is highest. The capacity of the holding tank will be determined in the Remedial Design Report. The proposed holding tank location is shown on Figure 2-3.

The holding tank will be designed to comply with applicable New Jersey regulations. The tank materials will be selected based on characteristics of site ground water. The tank design details will be evaluated in the design report. The determination of whether the tank will be above ground or below ground is a design issue that will be finalized in the Design Report.

#### 7.5.5 Data Requirements

All basic site data for the dewatering system design are already available from the previous site investigations. These data include the stratigraphy and thickness of each unit, hydraulic conductivity of each unit, and ground water table elevation. One important parameter, the specific yield or drainable porosity of the fill unit, has not been determined. However, this parameter can be estimated based on the fill materials's characteristics. Therefore, no additional data will be collected for the dewatering system design.

## 7.6 CONSTRUCTION OPERATION PLAN

This section describes a preliminary construction operation plan envisioned for implementation of the Interim Remedy.

### 7.6.1 Site Preparation

Prior to initiating construction operations, the clean zone/support zone, the decontamination area, and the staging area will be constructed. These facilities will require the use of a small portion of the site, because there is not adequate space for these facilities between the existing fence and Paterson Plank Road. The preliminary design envisions providing a layer of imported clean material consisting of a relatively small quantity (i.e., approximately 600 cubic yards) under the facilities which lie within the existing fence. The purpose of the imported clean material will be to provide a stable working surface and to prevent contact with the underlying site soils. A geotextile layer and membrane will be placed under the imported clean material to prevent contamination of this material. At the completion of construction, the material will be taken off-site. The final layout of these facilities will be determined during the design and specified in the Remedial Design Report.

Prior to initiation of Site construction, the Site vegetation will be cleared, chipped, and consolidated for placement under the infiltration barrier. The concrete foundations and cinder block walls that may interfere with infiltration barrier installation will be demolished and consolidated for placement under this barrier. The existing storage tank (T-5) which is currently on-site will be left undisturbed during the construction of the Interim Remedy. The HDPE liner to be used as an infiltration barrier will be placed up to and butted against the tank when the infiltration barrier is being installed. The existing tarp over the tank will be adjusted so that all future precipitation will run off the tarp onto the infiltration barrier.

#### 7.6.2 Construction Sequence

The existing rubble pile may be left in-place or moved depending upon whether it will interfere with construction activities. If it is moved, it will be consolidated and either placed below the infiltration barrier or placed above it and suitably covered. The planned disposition of the rubble pile during construction will be described in the Remedial Design Report. The construction work will be scheduled to allow the most efficient use of the site and the construction equipment. The work will be coordinated with local authorities to minimize construction traffic interfering with local traffic. The general sequence of Site construction is as follows:

1. Install a bank support system, if the need for one is identified during design;
2. Install the slurry wall. The slurry wall construction sequence is presented in Section 7.2.3;
3. Regrade the Site, possibly remove and consolidate the rubble pile, and install the infiltration barrier. Staging areas may have to be relocated as the infiltration barrier installation progresses;
4. Work around the existing tank;
5. Install dewatering system piping and holding tank;
6. Install the dewatering pumps and electrical work and test the pumps;
7. Clean up the Site and demobilize;
8. Start the dewatering operation and Site monitoring program.

A detailed construction sequence will depend upon final design considerations, and will be finalized in the Remedial Design Report.

#### 7.6.3 Site Security and Maintenance

During the Site construction, appropriate security measures will be provided to control access of unauthorized personnel and to prevent vandalism during non-working hours. As part of site mobilization, the existing site fence will be repaired and extended as required to fully enclose the Site. The fence sections damaged during construction activities will be repaired or completely replaced immediately at the end of construction.

The local fire department, police stations, and hospitals will be notified of the Site operation for quick coordination in the event of accidents, injuries, or security problems.

Currently, most of the surface water runoff flows from the FOU to Peach Island Creek. During construction operations, potential erosion and sediment from runoff will be controlled using standard construction erosion and sediment control measures prior to its continued drainage to Peach Island Creek. During the construction of the Interim Remedy, silt fences will be installed and maintained to minimize the loss of silt from the site due to run-off. Dust will be controlled during construction by spraying water on the actively disturbed areas and access roads.



100341

SECTION 8

SITE MAINTENANCE PLAN  
FOR DESIGN ACTIVITIES  
MARCH 1991

## TABLE OF CONTENTS

	<u>PAGE</u>
8.1 INTRODUCTION	8-1
8.2 SECURITY DURING SOIL BORING ACTIVITIES	8-3
8.2.1 Notification	8-3
8.2.2 Site Entry Procedures	8-3
8.2.3 Fence Maintenance	8-4
8.2.4 Continual Security Measures	8-4

## SITE MAINTENANCE PLAN FOR DESIGN ACTIVITIES

### 8.1 INTRODUCTION

This plan describes the Site security measures that will be implemented during the Interim Remedy design. This plan describes and applies to remedial design activities which may occur during the period of time from submission of the Remedial Design Work Plan on December 10, 1990 to the submission of the Remedial Design Report on March 11, 1991. Site security will be implemented primarily through the use of the existing six-foot high chain-linked fence with plastic webbing woven through it. The fence surrounds the Site on three sides. The fourth side is bordered by Peach Island Creek. A locked gate, located near the intersection of Paterson Plank Road and Gotham Parkway will be the sole entrance to the Site. At this time, lighting for night security is not present on-site and is only available from the adjacent streets. See Figure 2-1 for the Site map.

All personnel entering this Site for purposes related to the Interim Remedy, which include, but are not limited to, personnel from Canonie Environmental Services Corp. (Canonie) and Langan Environmental Services, Inc., subcontractors, and government representatives will be subject to the rules and procedures of this plan.

The present level of security at the Site will be maintained throughout the time period stated previously, with additional measures (as described in Section 8.2) to be taken while activity is occurring on the Site.

There will be no command trailer or sanitary facilities brought to or erected on the Site during the design phase activities. During this time period, most of the work will occur in King of Prussia, Pennsylvania or Elmwood Park, New Jersey. During the soil boring program, there are no plans to erect any permanent or temporary structures as command centers or sanitary facilities.

The structure now existing at the Site will be used to the extent necessary for communication purposes and temporary storage of samples and supplies during design field activities.

## 8.2 SECURITY DURING SOIL BORING ACTIVITIES

This section covers the period of time when Canonie personnel will be on-site to perform activities necessary for preparation of the Remedial Design Report. These activities include, but are not limited to, surveying and drilling of the soil borings along the expected alignment of the slurry wall and collecting ground water for compatibility testing of backfill mixtures.

### 8.2.1 Notification

Prior to entrance to the Site, the Facility Coordinator, Mr. Donald J. Murphy, Ph.D., P.E. of Langan Environmental Services, Inc., will be notified that Canonie personnel will be entering the Site. The Facility Coordinator will provide Canonie's project manager with a key which will unlock the gate to the Site. For work which will require more than one day, the Carlstadt Police Department will be notified that this activity will occur and its expected duration. The project supervisor or his designee will be responsible for monitoring and maintaining the security of the Site.

### 8.2.2 Site Entry Procedures

All equipment and personnel authorized to enter the Site must enter through the gate off of Paterson Plank Road. Keys to the gate will be held by the Facility Coordinator and Canonie's project manager or his designee. After opening the gate, an inspection of the fence on the perimeter of the Site will be made to verify that its integrity has not been compromised. Any damage will be repaired with similar material. Repetition of the damage will be reported to the Carlstadt Police Department and the Facility Coordinator. Any equipment previously left on-site will be examined by its owner and any vandalism will be reported to Canonie's site manager and the police. Each contractor and their subcontractors will be responsible for the security of their equipment and property. The expected number of personnel on-site at any time will usually be less than 12, with the maximum number occurring during the soil boring work.

100346

**Canonie**Environmental

### 8.2.3 Fence Maintenance

Since the six-foot chain-linked fence and locked gate are the only significant security measures, they will be maintained as to be effective. If the daily inspection results in the discovery of damage to the fence, gate, or lock, the damage will be repaired either by Canonie personnel using material from local hardware supply stores or subcontracted to a company which can provide 24-hour service, such as the Academy Fence Company located in Elizabeth, New Jersey. If the gate lock is damaged, it will be repaired within 24 hours and a new set of keys will be provided for the representatives of the EPA, the Facility Coordinator, and Canonie.

### 8.2.4 Continual Security Measures

When all authorized personnel have left the Site at the end of a day's normal activities, or if the Site will be vacated temporarily and after construction, all equipment on-site will be secured by lock and set in such a way as to remain inoperative until personnel return. The gate will be locked after the last personnel have left the Site. An effort will be made to minimize attracting attention toward the Site while it is vacant.

If there has been an unauthorized entry onto the Site or damage has occurred to the fence, gate, lock, or equipment stored on the Site by Canonie or its subcontractors, the Carlstadt Police Department will be contacted immediately. If this entry requires their services, the Carlstadt Fire Department and the New Jersey State Police will be available.

Carlstadt Police Department	(201) 438-4300
-----------------------------	----------------

Carlstadt Fire Department	(201) 438-4300
---------------------------	----------------

New Jersey State Police	(201) 338-8260
Garden State Parkway Patrol	
Bloomfield Station	

100347

**Canonie**Environmental

There is a working telephone in one of the buildings on the Site which can be used to report any security problems. The telephone number is (201) 935-5732. The Facility Coordinator will also be notified of any unauthorized entry to the Site by calling (201) 794-6969. If any unauthorized entry has occurred, the EPA will be contacted at (212) 264-6311. If unauthorized entry or damage has resulted in the release of hazardous materials, the NJDEP will be contacted using their 24-hour hotline at (609) 292-7172.



## REFERENCES

American Petroleum Institute Specification 13A, Thirteenth edition, July 1, 1990.

American Petroleum Institute Practice 13B-1, First edition, June 1, 1990.

American Society for the Testing of Materials (ASTM), 1989 Annual Book of ASTM Standards, Section 4 - Construction, Volume 4.08, Methods listed below:

D2488; Practice for Description and Identification of Soils (Visual-Manual Procedure);

D2435; Test Methods for One-Dimensional Consolidation Properties of Soils;

D2487; Test Methods for Classification of Soils for Engineering Purposes;

D2607; Classification of Peats, Mosses, Humus, and related Products;

D2216; Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures;

D1586; Method for Penetration Test and Split-Barrel Sampling of Soils;

D4220; Practices for Preserving and Transporting Soil Samples;

D1587; Practice for Thin-Walled Tube Sampling of Soils;

D422; Method for Particulate Size Analysis of Soils;

D854; Test Method for Specific Gravity of Soils;

100350

REFERENCES  
(Continued)

D2166; Test Method for Unconfined Compressive Strength of Cohesive Soil;

D4318; Test Method for Liquid Limit, Plasticity, Plasticity Index of Soils.

Attachment 8 of the Administrative Order for Consent Index Number 00116 - Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the Site (October 18, 1990).

29 Code of Federal Regulations (CFR) 1910 - Occupational Safety and Health Standards.

29 CFR 1926 - Safety and Health Regulations for Construction.

40 CFR 300 - National Oil and Hazardous Substances Pollution Contingency Plan.

Construction Specification Institute, "Manual of Practice", 1985 Edition, Construction Specification, 601 Madison Street, Alexandria, VA 22314.

Dames and Moore, "Final Report Remedial Investigation, SCP Site, Carlstadt, New Jersey", March 1990.

Dames and Moore, "Revised Draft Report, Excavation of Test Pits, SCP Site, Carlstadt, New Jersey", August 1989.

The United States Environmental Protection Agency (EPA) Contract Laboratory Program User's Guide 9240.0-1, December 1988.

EPA, Region II, "Region II CERCLA Quality Assurance Manual", March 1988.

EPA, "Samplers and Sampling Procedures for Hazardous Waste Streams", January 1980.

100351

REFERENCES  
(Continued)

EPA Slurry Trench Construction for Pollution Migration Control, EPA 540/2-84-001 February 1984.

EPA/530-SW-84-725 (SW925), Soil Properties Classification and Hydraulic Conductivity Testing.

EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW846, EPA 8704-0107.

"National Enforcement Investigations Center Policies and Procedures Manual", Revised May 1986.

National Institute for Occupational Safety and Health (NIOSH) Manual of Analytical Methods, Third Edition, Peter M. Eller, Ph.D., C.I.H., Editor, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Division of Physical Science and Engineering, Cincinnati, Ohio.

New Jersey Administrative Code (NJAC) Title 7, Chapter 26, Specific Disposal Regulations for Sanitary Landfills.

New Jersey Department of Environmental Protection Field Sampling Procedures Manual, February 1988.

The New Jersey Sports Complex, "Detailed Investigation of Subsurface Conditions", prepared by Frederic R. Harris, Inc. for the New Jersey Sports and Exposition Authority, October 1972.

OSWER Directive 9355.0-4A, "Superfund Remedial Design and Remedial Action Guidance", June 1986.

REFERENCES  
(Continued)

Reimer, G.E., "The Sedimentology and Stratigraphy of the Southern Basin of Glacial Lake", Passaic, New Jersey, Master's Thesis, Rutgers University, 1984.

Soil Conservation Service, "Manual for Soil and Erosion Control".

United States Department of Labor, "Chemical Information Manual", October 20, 1987.

United States Army Corps of Engineers EM1110-2-1906 "Permeability Testing with Back Pressure", November 1978.



TABLE 2-1

GEOTECHNICAL SAMPLING SCHEDULE FOR  
REMEDIAL DESIGN

<u>SOIL CLASS</u>	<u>TYPE OF ANALYSIS</u>	<u>NUMBER (1)</u> <u>OF</u> <u>LABORATORY TESTS</u>
FILL	Visual classification	All
PEAT	Visual classification	All
	Consolidation test	1
	Water content and density	2
	Specific gravity	1
SILT	Visual classification	All
	Sieve analysis	4
	Hydrometer	4
	Atterberg limits	2
	Water content and density	2
	Consolidation	1
	Specific gravity	4
VARVED OR RED CLAY	Visual classification	All
	Sieve analysis	5
	Hydrometer	5
	Permeability	3
	Water content and density	4
	Atterberg limits	6
	Specific gravity	5
	Unconfined compressive strength	3

Note:

- (1) An engineer experienced in geotechnical field investigations will be present during all drilling activities and will log subsurface conditions encountered. Based on the conditions observed in the field, this engineer shall select representative samples on which geotechnical testing will be performed. The scope of the laboratory testing may be adjusted by field engineer depending on subsurface conditions encountered.

100355

# Boring Log Legend

TABLE-2-2

## SAMPLE

No: Number: Soil samples are numbered consecutively from the ground surface. Core samples are numbered consecutively from the first core run.

Type: SS= Split-Spoon (2" O.D.)  
PT= Piston Tube

ST= Shelby Tube  
CR= Core Run

A= Auger Cuttings

Interval: The depth of sampling interval in feet below ground surface.

## BLOW COUNT

The number of blows required to drive a 2-inch O.D. split-spoon sampler with a 140 pound hammer falling 30-inches. When appropriate, the sampler is driven 18 inches and blow counts are reported for each 6-inch interval. The sum of blow counts for the last two 6-inch intervals is designated as the standard penetration resistance (N) expressed as blows per foot.

## RECOVERY IN INCHES

The length of sample recovered by the sampling device.

## U.S.C.S SOIL TYPE

The Unified Soil Classification System symbol for recovered soil samples determined by visual examination or laboratory tests. Refer to ASTM D2487-69 for a detailed description of procedure and symbols. Underlined symbols denote classifications based on laboratory tests (ie: ML), all others are based on visual classification only.

## PERCENT MOISTURE

Natural moisture content of sample expressed as percent of dry weight.

## qu,TSF

Unconfined compressive strength in tons per square foot obtained by Hand Penetrometer. Laboratory compression test values are indicated by underlining.

## CONTACT DEPTH

The contact depth between soil layers is interpreted from significant changes in recovered samples and observations during drilling. Actual changes between soil layers often occur gradationally and the contact depths shown on the boring logs should be considered as approximate.

## SOIL DESCRIPTION AND REMARKS

Soil descriptions include consistency or density, color, predominant soil types, and modifying constituents.

COHESIVE SOILS			GRANULAR SOILS	
Consistency	qu (TSF)	Blows/Ft.	Density	Blows Per Foot
Very Soft	less than 0.25	0-1	Very Loose	4 or less
Soft	0.25 to 0.50	2-4	Loose	5 to 10
Medium Stiff	0.50 to 1.00	5-8	Medium Dense	11 to 30
Stiff	1.00 to 2.00	9-15	Dense	31 to 50
Very Stiff	2.00 to 4.00	15-30	Very Dense	over 50
Hard	more than 4.00	Over 30		

## PARTICLE SIZE DESCRIPTION

Boulder= Larger than 12 inches.  
Cobble= 3 to 12 inches.  
Gravel= 0.187 to 3 inches.  
Sand= 0.074 mm to 4.76 mm.  
Silt and Clay= Smaller than 0.074 mm

## DEFINITION OF TERMS

Trace= 5 to 12 percent by weight.  
Some= 12 to 30 percent by weight.  
And= Approximately equal fractions.  
( )= Drillers observation.

## PIEZO.

(Piezometer) Screened interval of the piezometer installation is denoted by cross-hatching.

## GENERAL NOTE

The boring logs and related information depict subsurface conditions only at the specific locations and dates indicated. Soil conditions and water levels at other locations may differ from conditions occurring at these boring locations. Also the passage of time may result in a change in the conditions at these boring locations.

## SOIL TEST BORING REFUSAL

Defined as any material causing a blow count greater than 100 blows/6 inches. Such material may include bedrock, "floating" rock slabs, boulders, dense gravel seams, or cemented soils. Refusal is usually indicated in fractional notation showing number of blows as the numerator and inches of penetration as the denominator.

TABLE 4-1

## CHEMICAL HAZARD INFORMATION FOR IDENTIFIED OR SUSPECTED CHEMICALS

<u>Contaminant</u>	ACGIH OSHA NIOSH <sup>(a)</sup> <u>TWA / PEL/ TWA</u>	<u>IDLH</u>	<u>Physical Characteristics</u>	<u>Route of Exposure</u>	<u>Comments</u>
Acenaphthene	-/-/-		White needle solid	Skin, Ingestion	
Acenaphthylene	-/-/-		--	Ingestion	
Anthracene			Yellow crystal	Skin, Ingestion	
Arochlor 1242 (1232)	1/-/-		Heavy oil	Skin Ingestion Inhalation	
Benzene	-/1/-		Colorless liquid with an aromatic odor	Ingestion Inhalation Skin	Intended to change to 0.1 ppm TLV. Carcinogenic
Benzidene	-/-/-		Colorless or slightly reddish crystalline compound that darkens on exposure to light and air	Skin, Ingestion	Possible human carcinogen
Benzo(a)anthracene	-/-/-		--	Ingestion	
Benzo(a)pyrene	-/0.2/0.1 (mg/m <sup>3</sup> )		Yellowish crystal	Skin, Ingestion Inhalation	Carcinogen
Benzo(b) fluoranthene	-/-/-		--	Ingestion	
Benzo(ghi)perylene	-/-/-		--	Ingestion	
Chlorobenzene	75/75/-	2,400	Colorless liquid with a mild aromatic odor	Ingestion Inhalation Skin	

TABLE 4-1

CHEMICAL HAZARD INFORMATION FOR IDENTIFIED OR SUSPECTED CHEMICALS  
(Continued)

<u>Contaminant</u>	ACGIH OSHA NIOSH <sup>(a)</sup> <u>TWA / PEL/ TWA</u>	<u>IDLH</u>	<u>Physical Characteristics</u>	<u>Route of Exposure</u>	<u>Comments</u>
Chloroethane/ Ethyl chloride	1,000/1,000/1,000	20,000	Colorless liquid or gas with a pungent ether-type odor	Inhalation	
Chloroform	10/2/-		Colorless liquid with a pleasant sweet odor	Ingestion Inhalation Skin	Carcinogen
2-chlorophenol	-/-/-		Unpleasant penetrating odor	Inhalation Ingestion Skin	
1,1-dichloroethane	200/100/100	4,000	Colorless, aromatic ethereal odor. Saccharin taste.	Skin Inhalation Ingestion	
1,2-dichloroethane	10/1/1		Colorless, chloroform-like odor, sweet taste	Ingestion Inhalation Skin	
1,1-dichloroethylene	5/1/-		Colorless, chloroform-like odor, sweet taste	Ingestion	
1,2-transdichloro- ethylene	200/200/-	4,000	Colorless, pleasant odor	Ingestion Inhalation Skin	
2,4-dichlorophenol	-/-/-		White solid	Ingestion Skin	

TABLE 4-1

CHEMICAL HAZARD INFORMATION FOR IDENTIFIED OR SUSPECTED CHEMICALS  
(Continued)

<u>Contaminant</u>	ACGIH OSHA NIOSH <sup>(a)</sup> <u>TWA / PEL/ TWA</u>	<u>IDLH</u>	<u>Physical Characteristics</u>	<u>Route of Exposure</u>	<u>Comments</u>
Ethylbenzene	100/100/100	2,000	Colorless liquid with an aromatic odor	Ingestion Inhalation Skin	
Methylene Chloride	50/500/-		Colorless liquid with a chloroform-type odor	Ingestion	Carcinogen
Methyl ethyl ketone (2-butanone)	200/200/200		Colorless, acetone-like odor	Ingestion Corrosive to skin. Inhalation	
2,4-dimethylphenol	-/-/-		White crystalline solid	Ingestion Skin	
Naphthalene	10/10/10		White color, crystalline solid	Inhalation Skin Ingestion	
Styrene	50/50/50		Colorless liquid with a sweet aromatic odor at low concentrations, sharp penetrating disagreeable odor at high concentrations	Ingestion Inhalation Skin	
1,1,2,2-tetra- chloroethane	1/1/1		Colorless to pale liquid with a sickly sweet odor like chloroform	Ingestion Inhalation Skin	
Tetrachloroethylene	50/25/-		Colorless liquid with an odor like ether or chloroform	Ingestion Skin Inhalation	

TABLE 4-1

CHEMICAL HAZARD INFORMATION FOR IDENTIFIED OR SUSPECTED CHEMICALS  
(Continued)

<u>Contaminant</u>	ACGIH OSHA NIOSH <sup>(a)</sup> <u>TWA / PEL/ TWA</u>	<u>IDLH</u>	<u>Physical Characteristics</u>	<u>Route of Exposure</u>	<u>Comments</u>
Toluene	100/100/100	2,000	Colorless, benzene-like odor	Ingestion Inhalation Skin	
1,1,1-trichloro- ethane/methyl chloroform	350/350/-	1,000	Colorless liquid with a mild chloroform-type odor	Skin Ingestion Inhalation	
1,1,2-trichloro- ethane	10/10/10		Colorless liquid with a sweet odor like chloroform	Skin Ingestion Inhalation	
Trichloroethylene	50/50/50		Colorless liquid unless dyed with a sweet chloroform-like odor	Inhalation Ingestion Skin	
Vinyl chloride	5/1/-		Colorless gas, liquifies in a freezing mixture	Ingestion Inhalation Skin	
Phenol	5/5/5		Colorless to pink solid or thick liquid with a character- istic sweet tarry odor	Inhalation Ingestion Skin	
Arsenic	-/0.01/- (mg/m <sup>3</sup> )		Appearance and odor varies	Inhalation Ingestion Skin	Carcinogen
Benzo(a)pyrene	-/0.2/0.1 (mg/m <sup>3</sup> )		Solid	Inhalation, Skin, Ingestion	
Cyanide (total)	-/5/5 (mg/m <sup>3</sup> )		Gas at room temperature	Inhalation Skin, Ingestion	Specific compound unidentified-treat

TABLE 4-1

CHEMICAL HAZARD INFORMATION FOR IDENTIFIED OR SUSPECTED CHEMICALS  
(Continued)

<u>Contaminant</u>	ACGIH OSHA NIOSH <sup>(a)</sup> <u>TWA / PEL/ TWA</u>	<u>IDLH</u>	<u>Physical Characteristics</u>	<u>Route of Exposure</u>	<u>Comments</u>
Nickel	1/1/0.015 (mg/m <sup>3</sup> )		Appearance varies	Inhalation Ingestion	Carcinogen
Acetone	750/750/250	20,000	Mint odor	Inhalation Ingestion Skin	
Butanol	50/50/50 Ceiling	10,000	Pleasant odor	Inhalation Ingestion Skin	
Butyl Acetate	200/150/150	10,000	Fruity odor	Inhalation Ingestion Skin	
Hexane	50/50/50	5,000	Gasoline-like odor	Inhalation Ingestion Skin	
Isopropanol	400/400/400	20,000	Colorless liquid with an odor of rubbing alcohol	Inhalation Ingestion Skin	

(a) Units are in parts per million in air unless otherwise noted.

TABLE 4-2  
ACTIVITY - SPECIFIC LEVELS OF PROTECTION

<u>Activity</u>	<u>Required Level of Protection</u>	<u>Special Requirements</u>
Soil Boring	"C/B"	"C" minimum at all times
Ground Water Collection	"C"	B may be necessary if vinyl chloride is detected via the colorimetric detector tubes or if vapors are present in concen- trations >50 ppm
Surveying	"D"	Level "C" PPE while drilling activities are occurring

TABLE 4-3

## SITE-SPECIFIC AIR MONITORING PROGRAM

<u>Monitoring Type</u>	<u>Compounds To Detect</u>	<u>Frequency</u>	<u>Action Level</u>	<u>Steps To Be Taken</u>
H-Nu (PID)	Volatile organics	Every 15 minutes during work activity in Level "C" PPE	50 ppm for 5 minutes	Upgrade to Level B, PPE
OVA (FID)	Volatile organics	Every 15 minutes during work activity in Level "C" PPE	50 ppm for 5 minutes	Upgrade to Level B, PPE
CGI/O <sub>2</sub>	% LEL/O <sub>2</sub>	Every 15 minutes at borehole	10% LEL/less than 19.5% O <sub>2</sub>	Stop auger until SSO indicates levels are safe
Detector Tubes	Vinyl chloride	3 times/day during work activity in Level "C" PPE	Above 1 ppm	Upgrade to Level B, PPE

TABLE 6-1

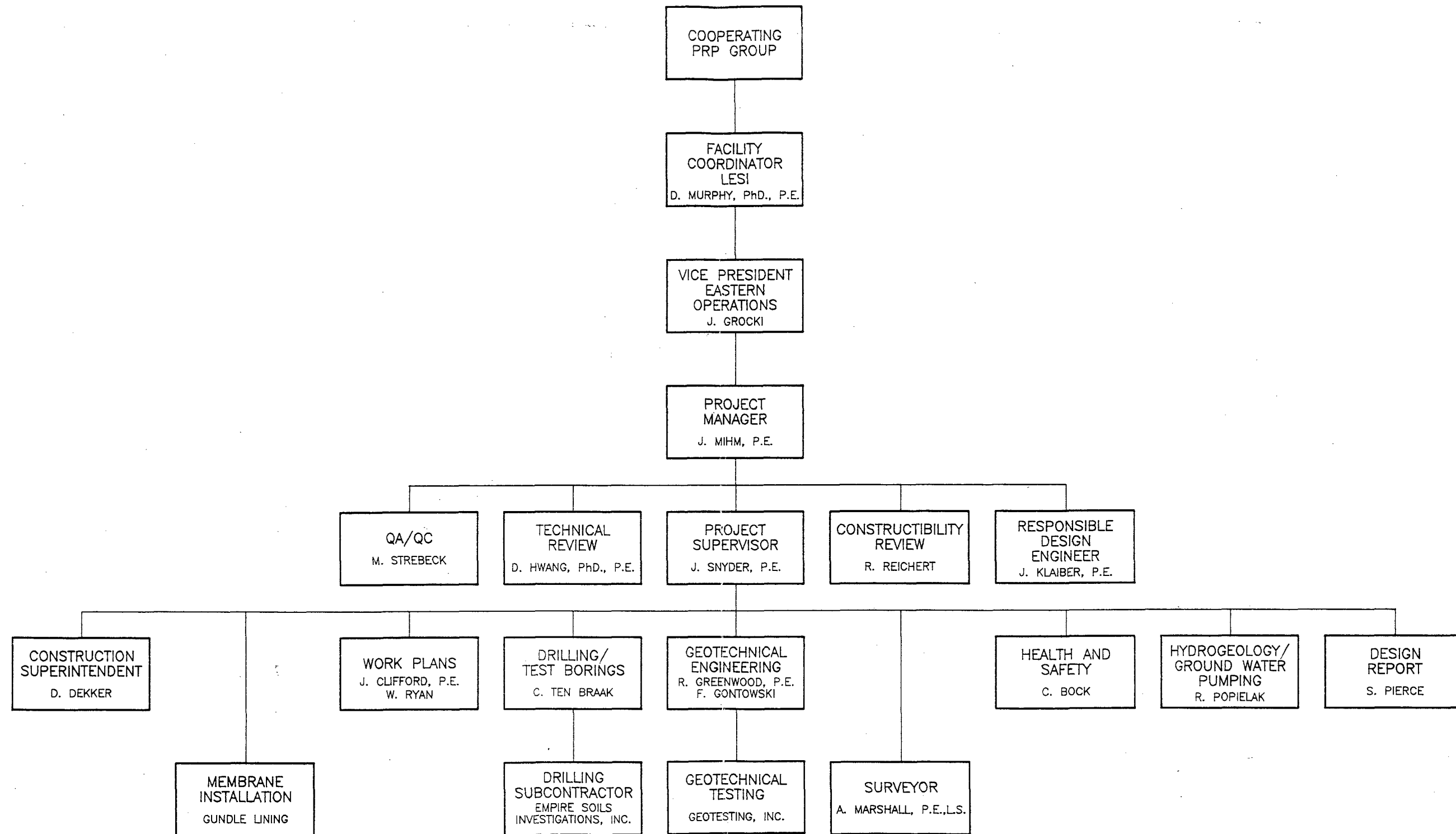
SCHEDULE FOR OBTAINING ACCESS AND APPROVALS  
FOR REMEDIAL DESIGN ACTIVITIES

<u>Activity Requiring Access/Approvals</u>	<u>Access/Approval Needed</u>	<u>Anticipated Activity Start Date</u>	<u>Date When Access/Approval Requested</u>
Geotechnical Investigation	On-Site Access	04/08/91	12/04/90
Soil Boring Installation greater than 25 feet in depth	Boring Installation Permit	04/11/91	01/30/91

**FIGURES**

## FIGURES

This section contains the figures for the Remedial Design Work Plan. The normal format for each figure includes an ISSUE / REVISION block in the lower left side. The information in this block is the number of the issue or revision, the date, the purpose for the figure, and which Canonie Environmental Services Corp. employee drew, checked, or approved the figure. The information is noted for internal reasons and does not infer acceptance of the figure or its contents by the client or agency which will be performing the final review.



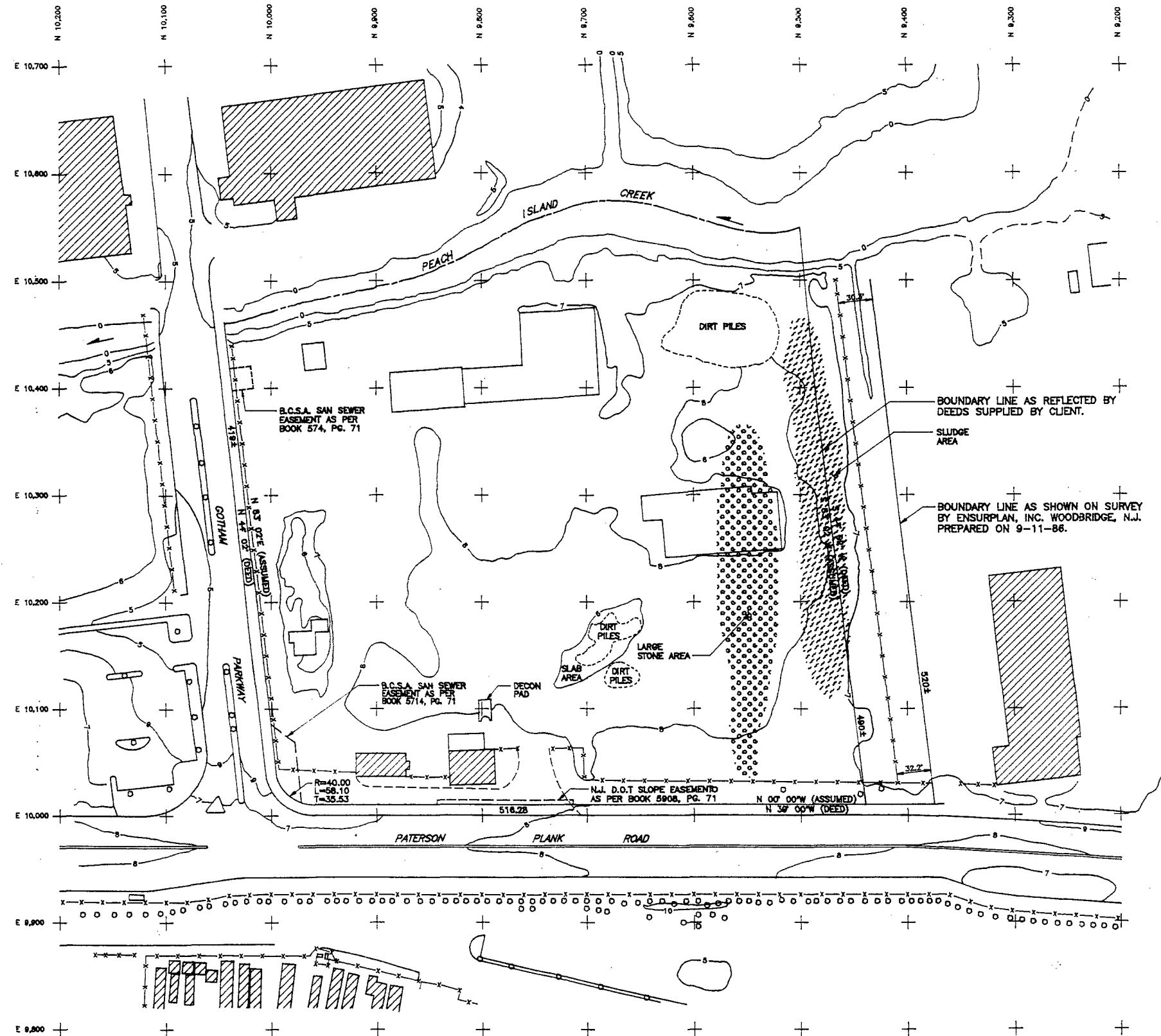
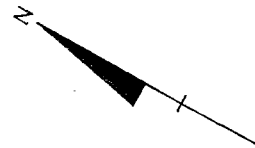
3/2/91	ISSUED FOR AGENCY REVIEW	WLH	SDP	
3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
12-6-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
11-26-90	ISSUED FOR CLIENT REVIEW	WLH	S.D.P.	
10-31-90	ISSUED FOR PROPOSAL	WLH	S.D.P.	J.K.S.
No.	DATE	ISSUE / REVISION		
		DWN. BY	CHK'D BY	AP'D BY

PROJECT ORGANIZATION CHART  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY  
PREPARED FOR  
COOPERATING PRP GROUP

**Canonie**Environmental

DATE: 10-31-90	FIGURE 1-1	DRAWING NUMBER 90-198-B1
SCALE: NONE		

DRAWING  
NUMBER  
90-198-E6

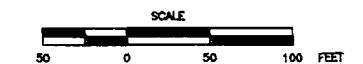


**LEGEND:**

- LARGE STONE AREA
- SLUDGE AREA
- EXISTING BUILDING
- EXISTING FOUNDATION
- DIRECTION OF FLOW
- FENCE
- TREES
- EXISTING CONTOUR
- CENTERLINE OF CREEK

**NOTE:**

1. PEACH ISLAND CREEK IS AFFECTED BY TIDAL FLOW.
2. ASSUMED COORDINATE BASE IS USED BEGINNING WITH N 10,000 E 10,000 AT THE INTERSECTION OF CURBLINES OF PATERSON PLANK ROAD & GOTHAM PARKWAY. GRID IS PERPENDICULAR TO PATERSON PLANK ROAD.
3. THE LOCATIONS OF ALL UTILITIES WILL BE ADDED DURING THE DESIGN.
4. RI REPORT INDICATES THAT APPROXIMATELY 80 PERCENT OF THE SITE IS WITHIN THE 100-YEAR FLOOD PLAIN.



TOPOGRAPHIC BASE MAP  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY  
PREPARED FOR

COOPERATING PRP GROUP

**Canonie**Environmental

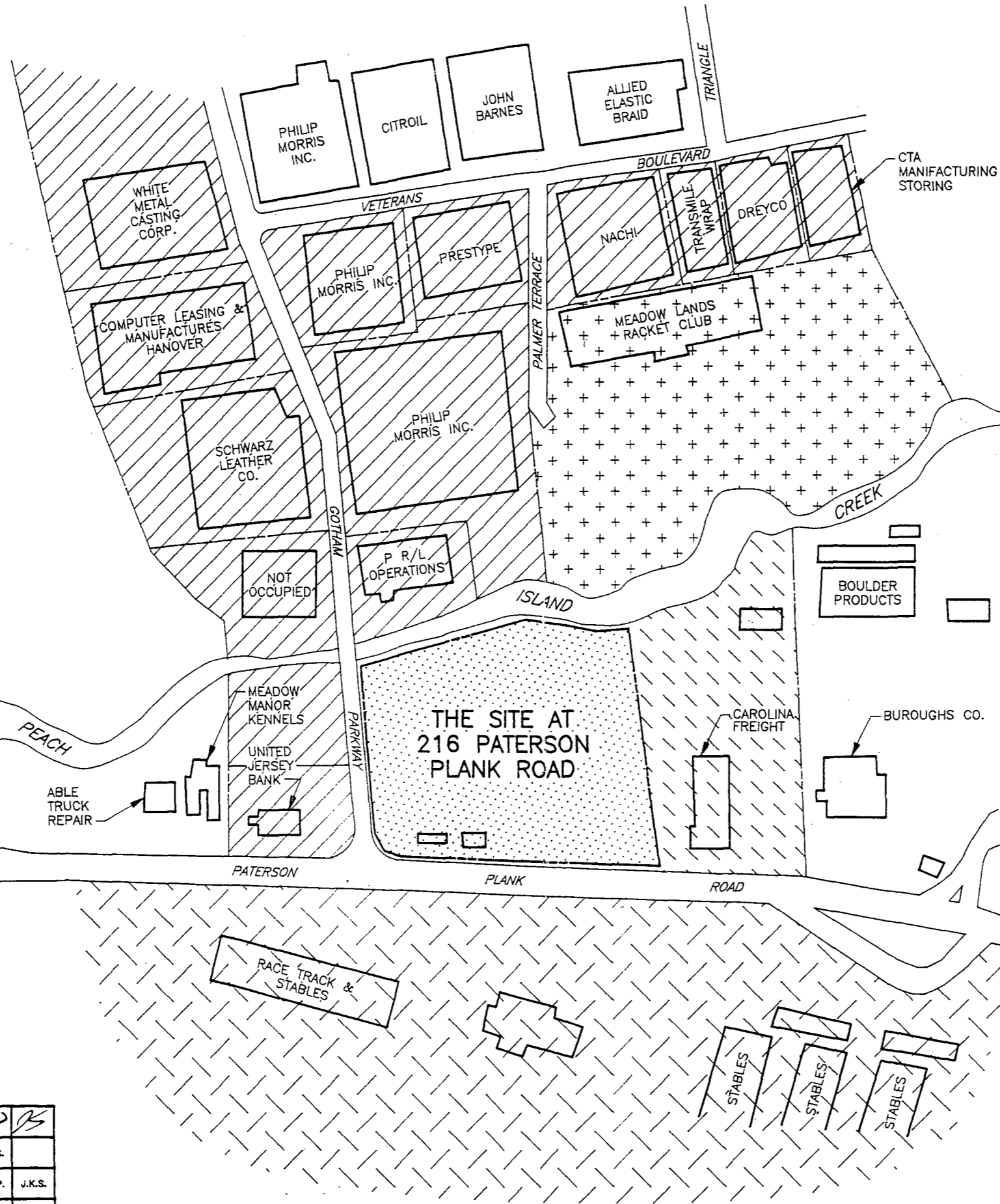
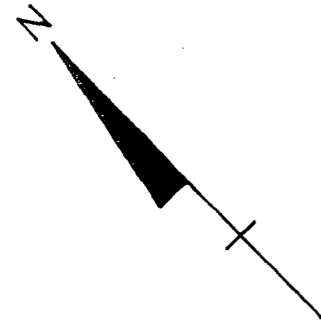
△	5/21/91	ISSUED FOR AGENCY REVIEW	WJH	SDP	/S
△	3-15-91	ISSUED FOR CLIENT REVIEW	WJH	J.K.S.	
△	12-8-90	ISSUED FOR AGENCY REVIEW	J.M.R.	S.D.P.	J.K.S.
△	11-27-90	ISSUED FOR CLIENT REVIEW	J.M.R.	S.D.P.	
No.	DATE	ISSUE / REVISION	OWN. BY	CK'D BY	AP'D BY

**REFERENCES:**

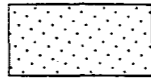

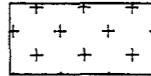
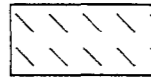

- BOUNDARY AND TOPOGRAPHIC SURVEY PREPARED BY ANDREW MARSHALL JR., P.E., L.S., DATED SEPTEMBER 17, 1987, THEIR PROJECT NO. 83-235.

DATE:	11-13-90	FIGURE 2-1	DRAWING NUMBER	REV.
SCALE:	AS SHOWN		90-198-E6	△

100368



**LEGEND:**

-  SITE AT 216 PATERSON PLANK ROAD
-  GOTHAM INDUSTRIAL PARK
-  AMOR REALTY
-  CAROLINA FREIGHT
-  NEW JERSEY SPORTS AND EXPOSITION AUTHORITY

**NOTE:**

1. APPROXIMATE PROPERTY LINES ARE SHOWN. NOT TO SCALE.

**REFERENCES:**

-"INDUSTRY IN THE VICINITY OF THE SCP SITE" DAMES & MOORE  
DATE FEBRUARY, 1988

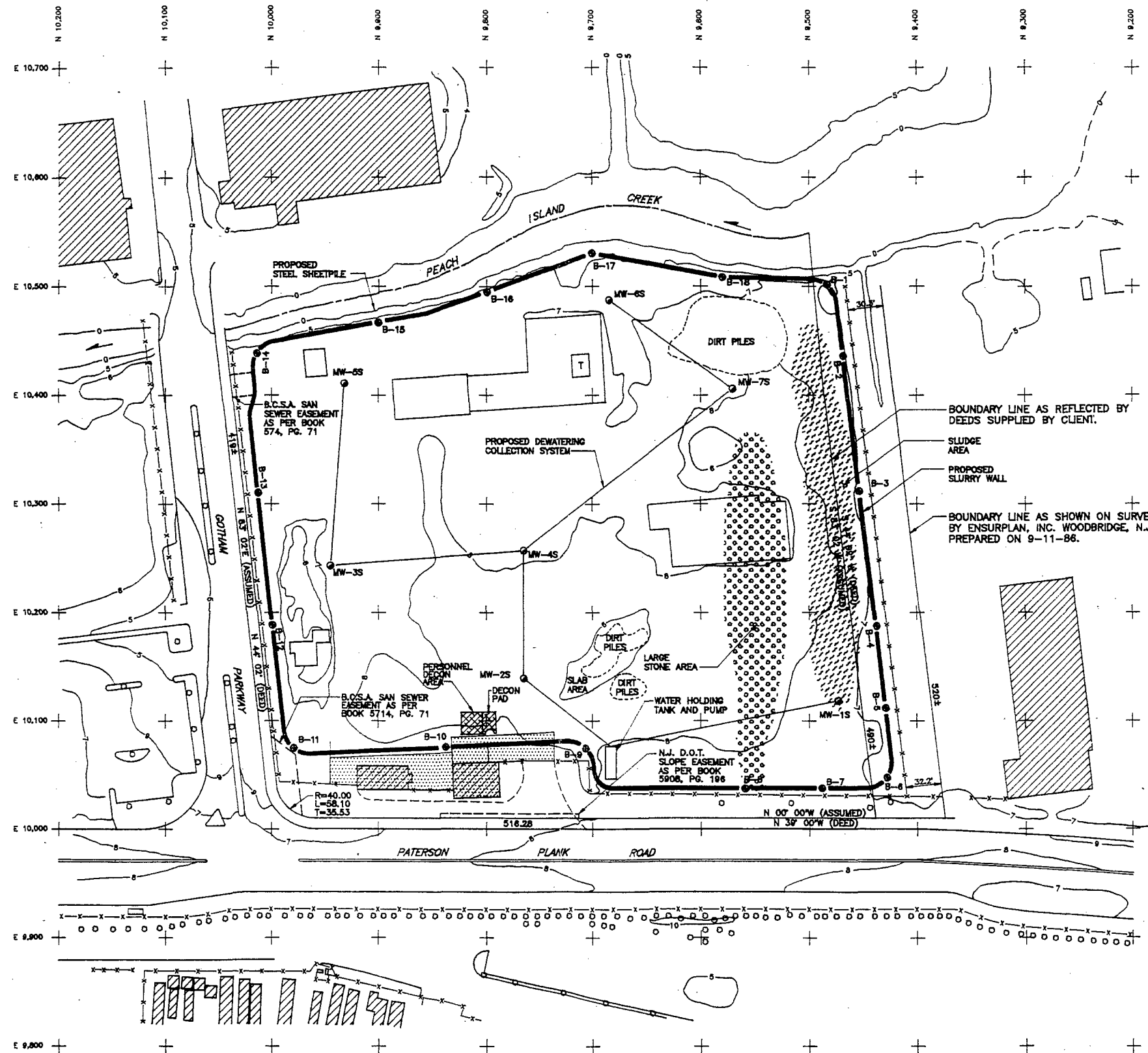
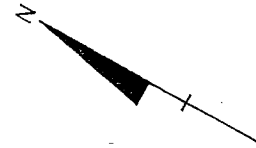
3	3/2/91	ISSUED FOR AGENCY REVIEW	WLH	SDP	BS
2	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
1	12-8-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
No.	DATE	ISSUE / REVISION	OWN. BY	CHK'D BY	APP'D BY

PROPERTY OWNER MAP  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

PREPARED FOR  
COOPERATING PRP GROUP  
**Canonie Environmental**

DATE: 11-18-90	FIGURE 2-2	DRAWING NUMBER 90-198-B13
SCALE: N.T.S.		

DRAWING  
NUMBER 90-198-E14

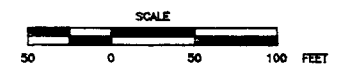


**LEGEND:**

- LARGE STONE AREA
- SLUDGE AREA
- EXISTING BUILDING
- EXISTING FOUNDATION
- CLEAN ZONE/SUPPORT ZONE
- PERSONNEL DECON AREA
- DIRECTION OF FLOW
- FENCE
- TREES
- EXISTING CONTOUR
- CENTERLINE OF CREEK
- PROPOSED SLURRY WALL
- PROPOSED BORING LOCATION
- EXISTING SHALLOW MONITORING WELL
- EXISTING STORAGE TANK T-5

**NOTE:**

1. PEACH ISLAND CREEK IS AFFECTED BY TIDAL FLOW.
2. ASSUMED COORDINATE BASE IS USED BEGINNING WITH N 10,000 E 10,000 AT THE INTERSECTION OF CURBLINES OF PATERSON PLANK ROAD & GOTHAM PARKWAY. GRID IS PERPENDICULAR TO PATERSON PLANK ROAD.
3. THE SLURRY WALL ALIGNMENT IS PRELIMINARY. THE FINAL ALIGNMENT WILL BE PROVIDED IN THE FINAL DESIGN REPORT.
4. THE TWO EXISTING BUILDINGS ON SITE ARE WITHIN THE CLEAN ZONE.
5. BORINGS B-1, B-6, B-11, AND B-14 WILL PENETRATE THE CLAY LAYER. THE FINAL SELECTION OF FULLY PENETRATING BORINGS WILL BE MADE IN THE FIELD.



SLURRY WALL/  
BORING LOCATION PLAN  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

PREPARED FOR

COOPERATING PRP GROUP

**Canonie Environmental**

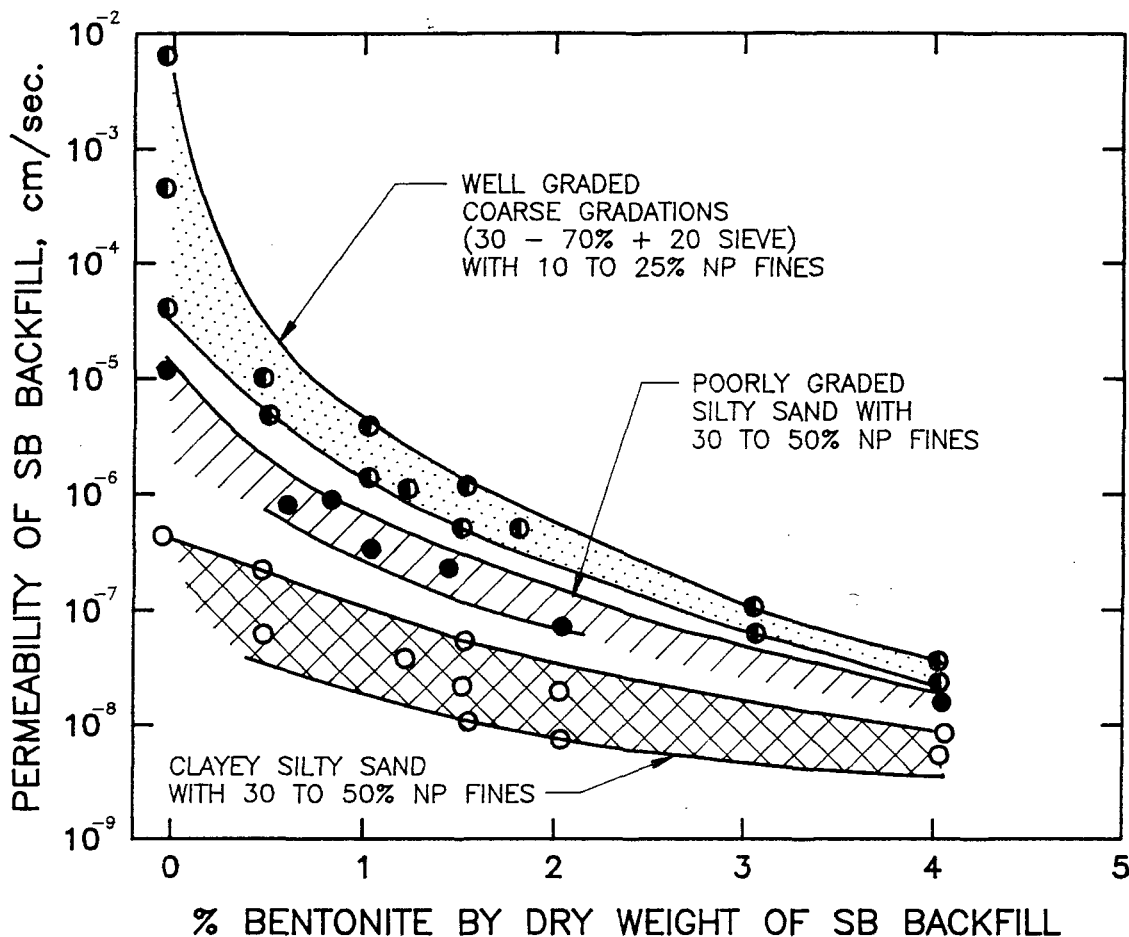
3/21/91	ISSUED FOR AGENCY REVIEW	J.M.R.	SDP	BS
3-15-91	ISSUED FOR CLIENT REVIEW	J.M.R.	J.K.S.	
12-6-90	ISSUED FOR AGENCY REVIEW	J.M.R.	S.D.P.	J.K.S.
11-27-90	ISSUED FOR CLIENT REVIEW	J.M.R.	S.D.P.	
No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY

**REFERENCES:**

- BOUNDARY AND TOPOGRAPHIC SURVEY PREPARED BY ANDREW MARSHALL JR., P.E., L.S. DATED SEPTEMBER 17, 1987; THEIR PROJECT NO. 85-236.

DATE: 11-13-90	FIGURE 2-3	DRAWING NUMBER 90-198-E14	REV.
SCALE: AS SHOWN			

100370



REFERECNES:

- SOIL-BENTONITE SLURRY TRENCH  
CUT-OFF WALLS  
D.J. D'APPOLONIA, C.R. RYAN, 1979.

PERMEABILITY VERSUS  
PERCENT BENTONITE  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

PREPARED FOR  
COOPERATING PRP GROUP

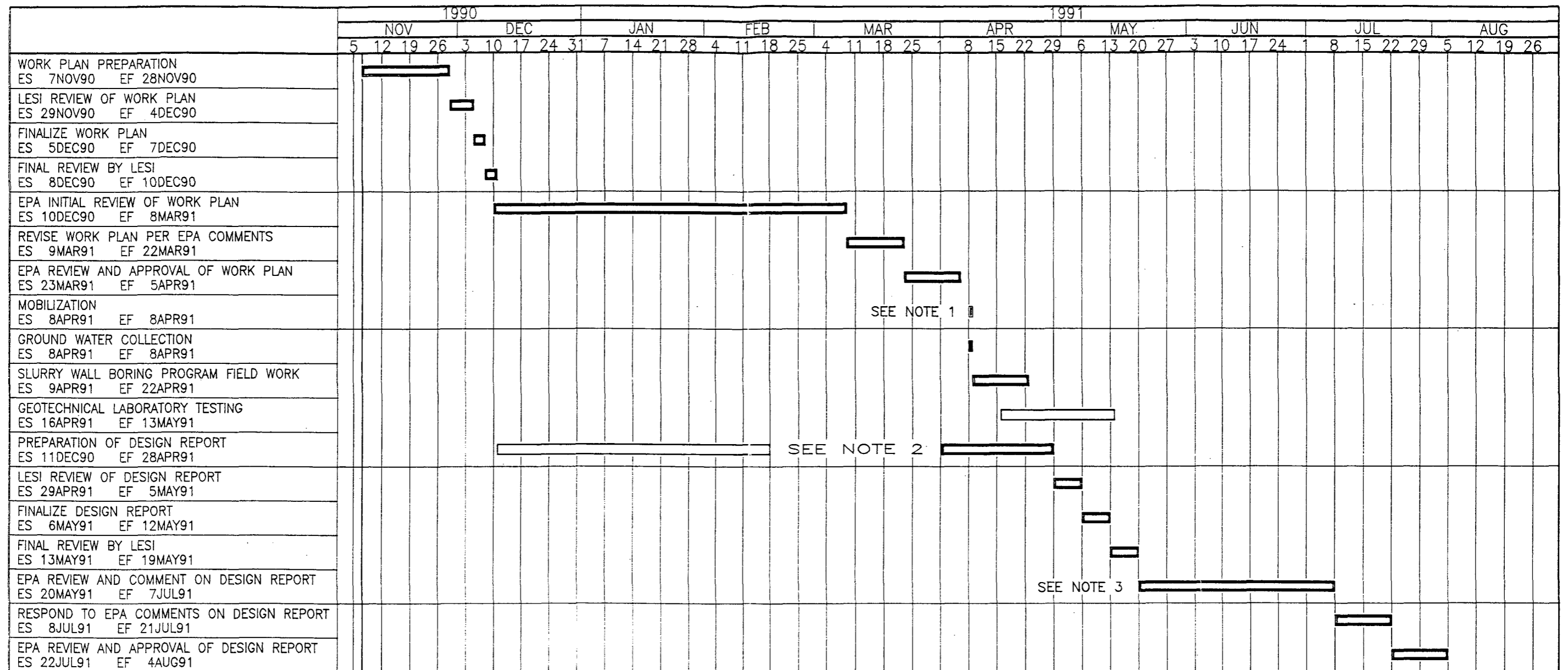
**Canonie**Environmental

4	3/21/91	ISSUED FOR AGENCY REVIEW	WLH	SDP	JS
3	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
2	12-6-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
1	11-26-90	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
No.	DATE	ISSUE / REVISION	OWN.	BY CK'D BY	AP'D BY

DATE: 11-16-90  
SCALE: N.T.S.

FIGURE 2-4

DRAWING NUMBER  
90-198-A7

**LEGEND:**

- [Critical Bar] NON CRITICAL ACTIVITY  
[Critical Bar] CRITICAL ACTIVITY

**NOTES:**

1. APPROVAL TO COMMENCE SOIL BORING ACTIVITIES MUST BE OBTAINED BY APRIL 5, 1991 IN ORDER FOR CONSTRUCTION OF THE SLURRY WALL AND INFILTRATION BARRIER TO BE COMPLETED WITHIN THE 1991 CONSTRUCTION SEASON.
2. DESIGN REPORT PREPARATION WAS PUT ON HOLD PENDING INITIAL REVIEW OF THE WORK PLAN.
3. SCHEDULE FOR REVIEW OF THE REMEDIAL DESIGN REPORT INCLUDES 7 WEEKS FOR INITIAL REVIEW 2 WEEKS FOR REVISIONS AND 2 WEEKS FOR REVIEW AND APPROVAL.

SCHEDULE FOR  
REMEDIAL DESIGN  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

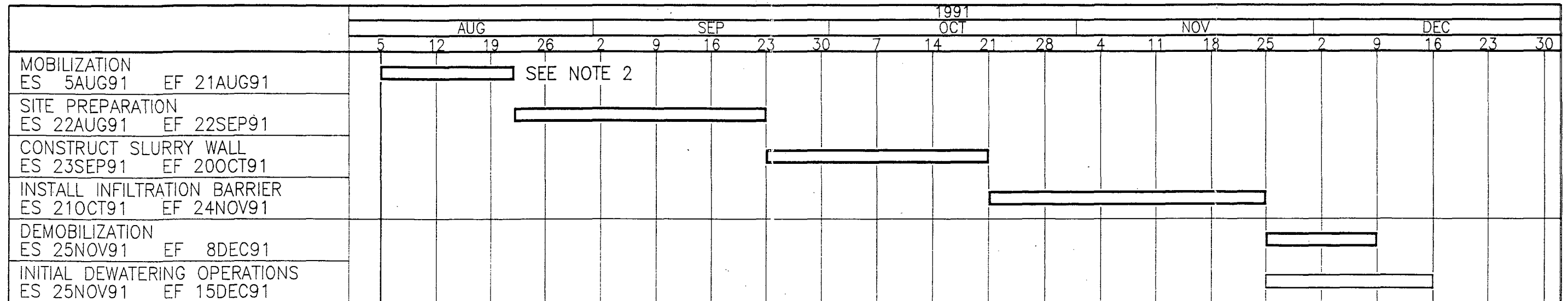
PREPARED FOR  
COOPERATING PRP GROUP  
**Canonie**Environmental

DATE: 3-13-91  
SCALE: NONE

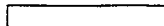

FIGURE 5-1

DRAWING NUMBER  
90-198-B54

3/21/91	ISSUED FOR AGENCY REVIEW	J.M.R.	SDP	95
3-15-91	ISSUED FOR CLIENT REVIEW	J.M.R.	J.K.S.	
No.	DATE	ISSUE / REVISION	OWN. BY	CK'D BY







**LEGEND:**

-  NON CRITICAL ACTIVITY
-  CRITICAL ACTIVITY

**NOTES:**

1. TOTAL DURATION FROM MOBILIZATION TO DEMOBILIZATION IS 18 WEEKS.
2. START OF MOBILIZATION IS BASED UPON ANTICIPATED APPROVAL OF REMEDIAL DESIGN REPORT BY AUGUST 2, 1991.
3. LATEST POSSIBLE START DATE FOR COMPLETION IN THE 1991 CONSTRUCTION SEASON IS AUGUST 12, 1991.

	3/21/91	ISSUED FOR AGENCY REVIEW	J.M.R.	SDP	15
	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
	12-8-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
	11-27-90	ISSUED FOR CLIENT REVIEW	WLH	J.T.C.	
No.	DATE	ISSUE / REVISION	DWN. BY	CHK'D BY	APP'D BY

DRAFT SCHEDULE FOR  
REMEDIAL CONSTRUCTION  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

PREPARED FOR  
COOPERATING PRP GROUP

CanonieEnvironmental

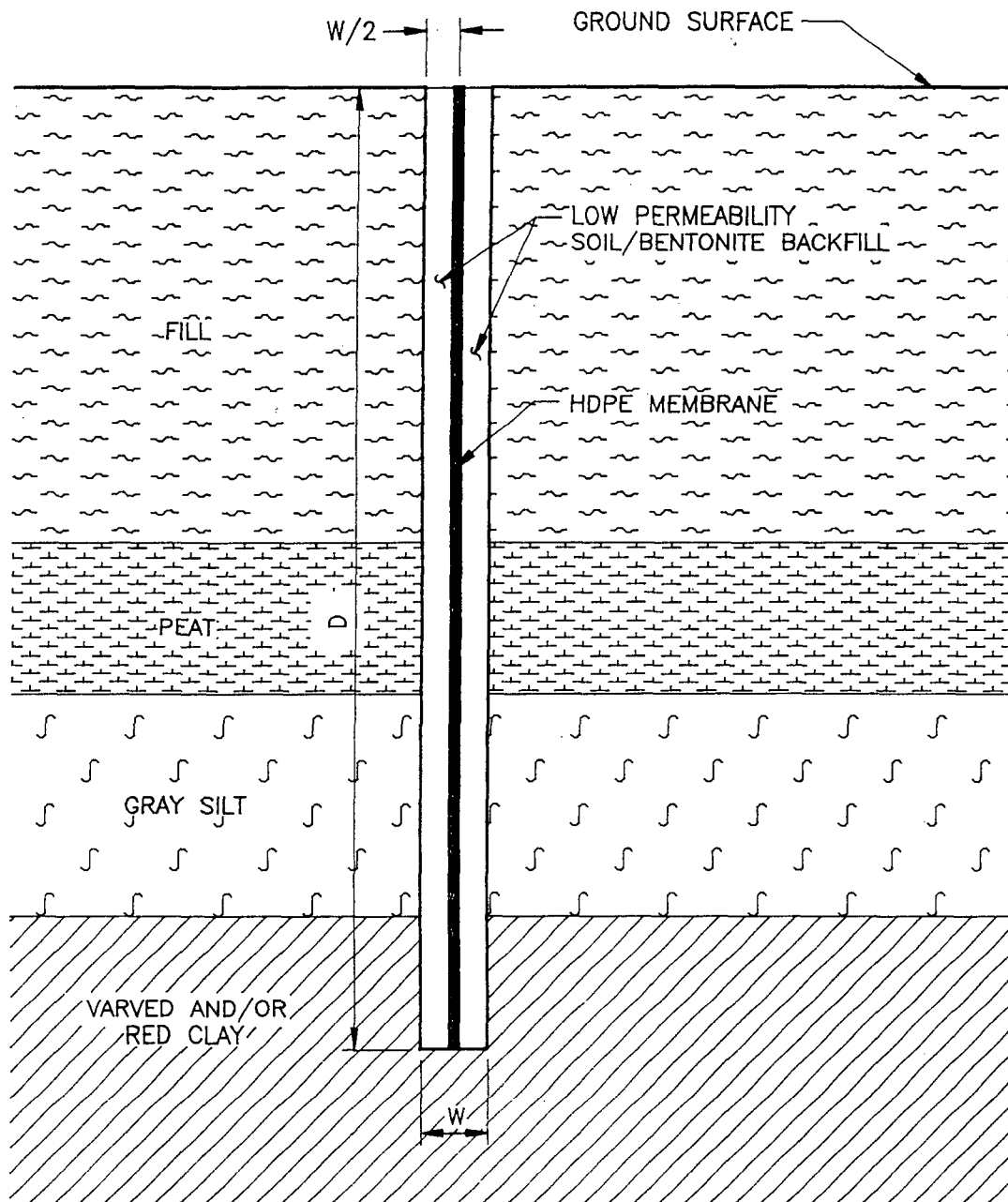
DATE: 11-21-90	FIGURE 5-2	DRAWING NUMBER 90-198-B22
SCALE: NONE		

	1991												1992												1993												1994																																	
	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D																																
SITE INSPECTION	◆				◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆																													
EROSION CONTROL	◆				◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆																													
QUARTERLY GROUND WATER MONITORING, LESI	◆				◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆																													
WELL/FENCE MAINTENANCE	◆				◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆			◆																													
CONTINUED DEWATERING																																																																						

△	3/2/91	ISSUED FOR AGENCY REVIEW	J.M.R.	SDP	JS
△	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
△	12-8-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
△	11-27-90	ISSUED FOR CLIENT REVIEW	WLH	J.T.C.	
No.	DATE	ISSUE / REVISION	OWN. BY	CHK'D BY	APP'D BY

LEGEND:  
===== DURATION OF CONTINUED DEWATERING IS UNCERTAIN.

DRAFT SCHEDULE FOR  
OPERATION AND MAINTENANCE  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY  
PREPARED FOR  
COOPERATING PRP GROUP  
CanonieEnvironmental



**NOTES:**

1. DRAWING NOT TO SCALE.
2. ACTUAL STRATIGRAPHY AND DIMENSIONS D AND W WILL BE DETERMINED DURING REMEDIAL DESIGN PHASE.

TYPICAL  
SLURRY WALL SECTION  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY  
PREPARED FOR  
COOPERATING PRP GROUP

**Canonie Environmental**

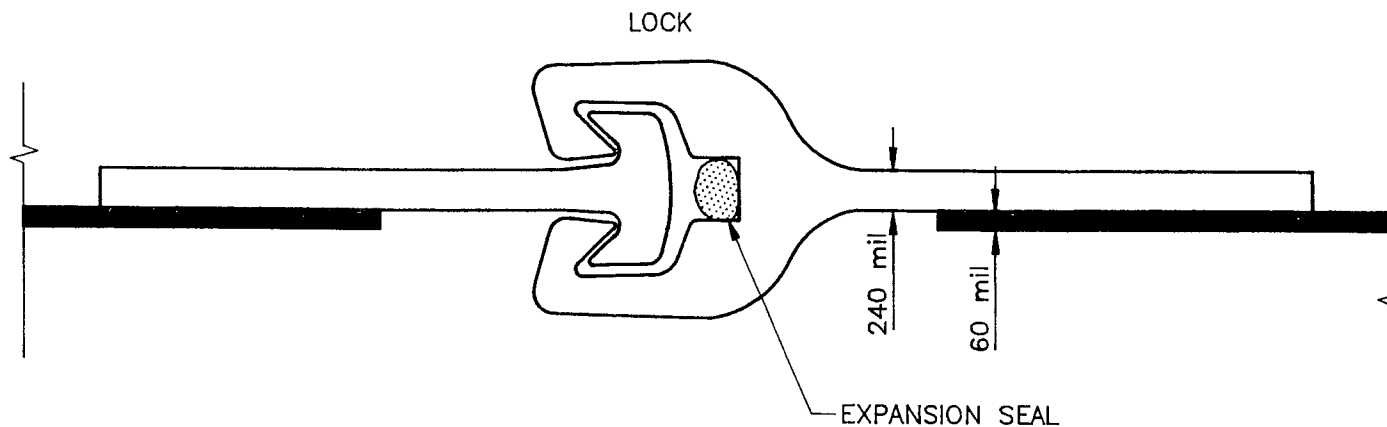
4	3/21/91	ISSUED FOR AGENCY REVIEW	WLH	SDP	JS
3	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
2	12-6-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
1	11-26-90	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
No.	DATE	ISSUE / REVISION	OWN. BY	CK'D BY	AP'D BY

DATE: 11-18-90  
SCALE: N.T.S.

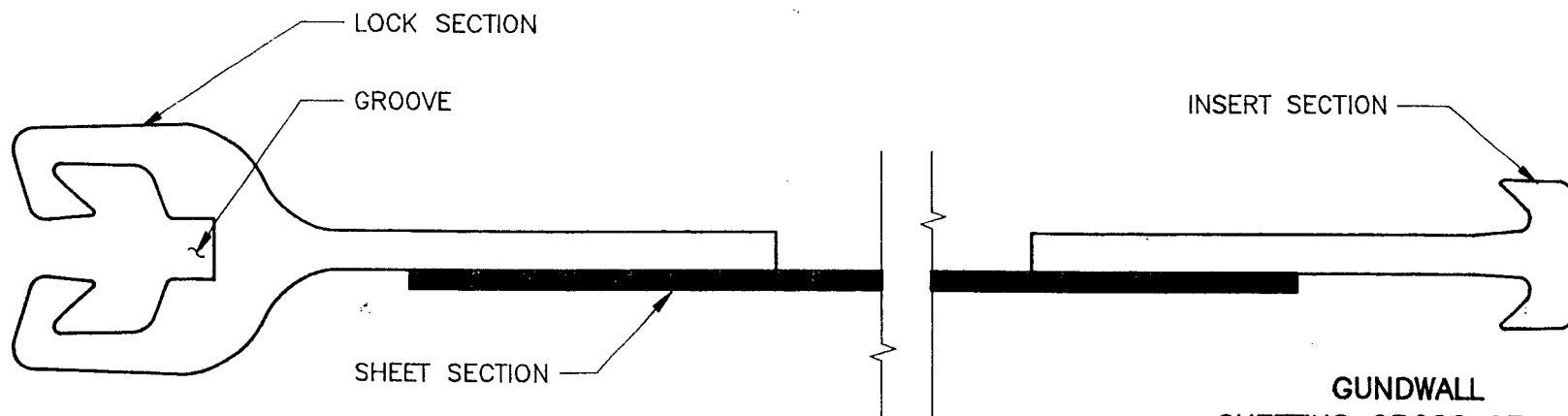
FIGURE 7-1

DRAWING NUMBER  
90-198-A11

DRAWING  
NUMBER 90-198-A19



INTERLOCK DETAIL



SINGLE SHEET

GUNDWALL  
SHEETING CROSS SECTION  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

PREPARED FOR  
COOPERATING PRP GROUP  
**Canonie** Environmental

4	3/2/91	ISSUED FOR AGENCY REVIEW	WLH	SDF	VS
3	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
2	12-8-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
1	11-26-90	ISSUED FOR CLIENT REVIEW	WLH	S.D.P.	
No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY

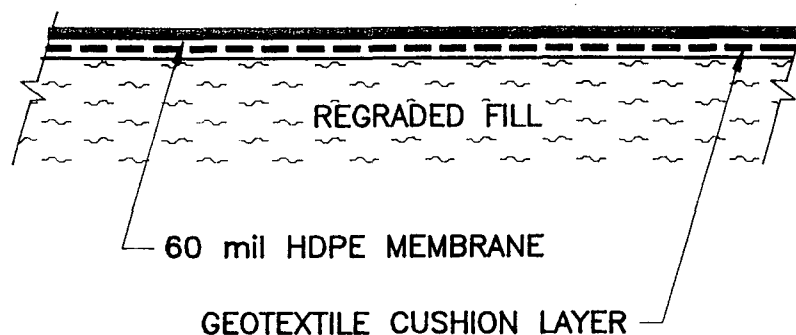
DATE: 11-20-90  
SCALE: N.T.S.

FIGURE 7-2

DRAWING NUMBER  
90-198-A19

**NOTE:**

1. A MEMBRANE WEIGHTING SYSTEM TO PREVENT MOVEMENT OF THE HDPE MEMBRANE WILL BE PLACED ON TOP OF THE INFILTRATION BARRIER.



PROPOSED  
INFILTRATION BARRIER SECTION  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

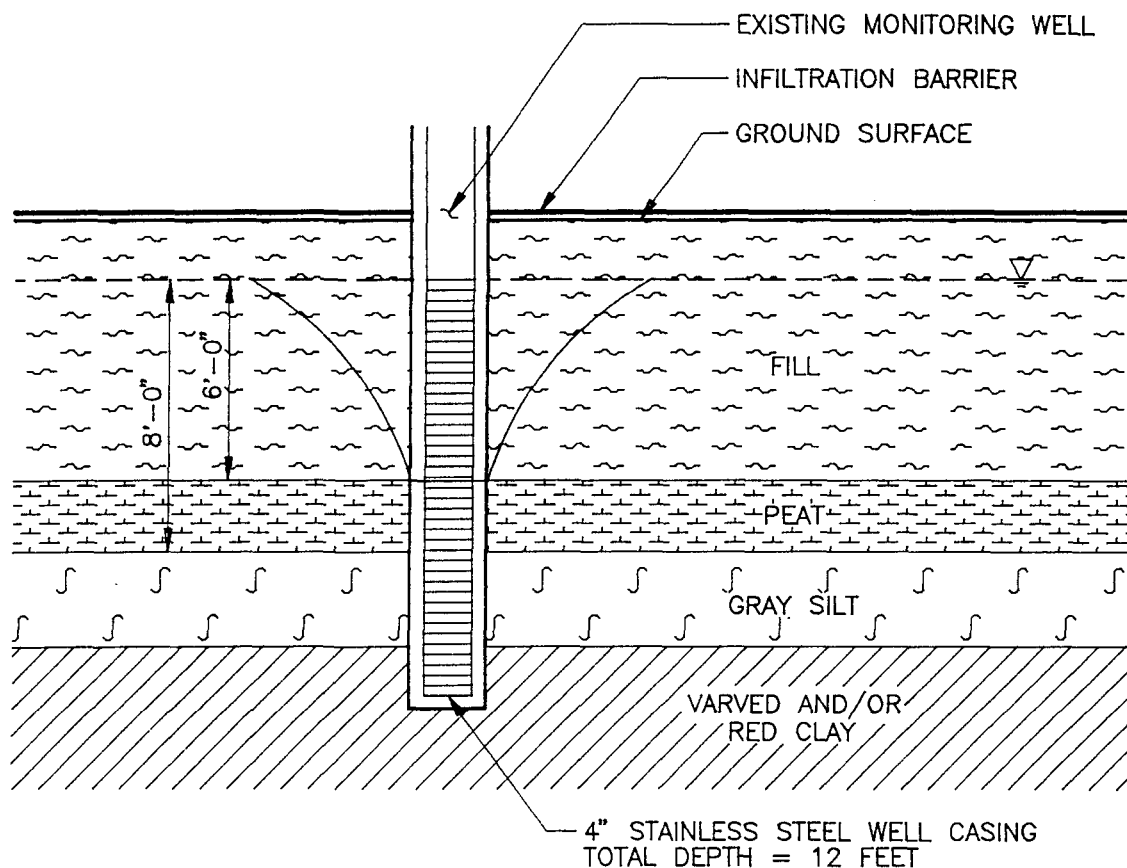
PREPARED FOR  
COOPERATING PRP GROUP  
**Canonie** Environmental

4	3/2/91	ISSUED FOR AGENCY REVIEW REMOVED 12" EROSION-RESISTANT SOIL	J.M.R.	SDP	JS
3	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
2	12-6-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
1	11-27-90	ISSUED FOR CLIENT REVIEW	WLH	S.D.P.	
No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY

DATE: 11-16-90  
SCALE: N.T.S.

FIGURE 7-3

DRAWING NUMBER  
90-198-A8



### LEGEND:

▽ WATER LEVEL

### NOTE:

1. DEWATERING WILL DRAW DOWN GROUND WATER IN THE BOTTOM OF THE FILL LAYER.

DEWATERING WELL SCHEMATIC  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY  
PREPARED FOR  
COOPERATING PRP GROUP

**Canonie**Environmental

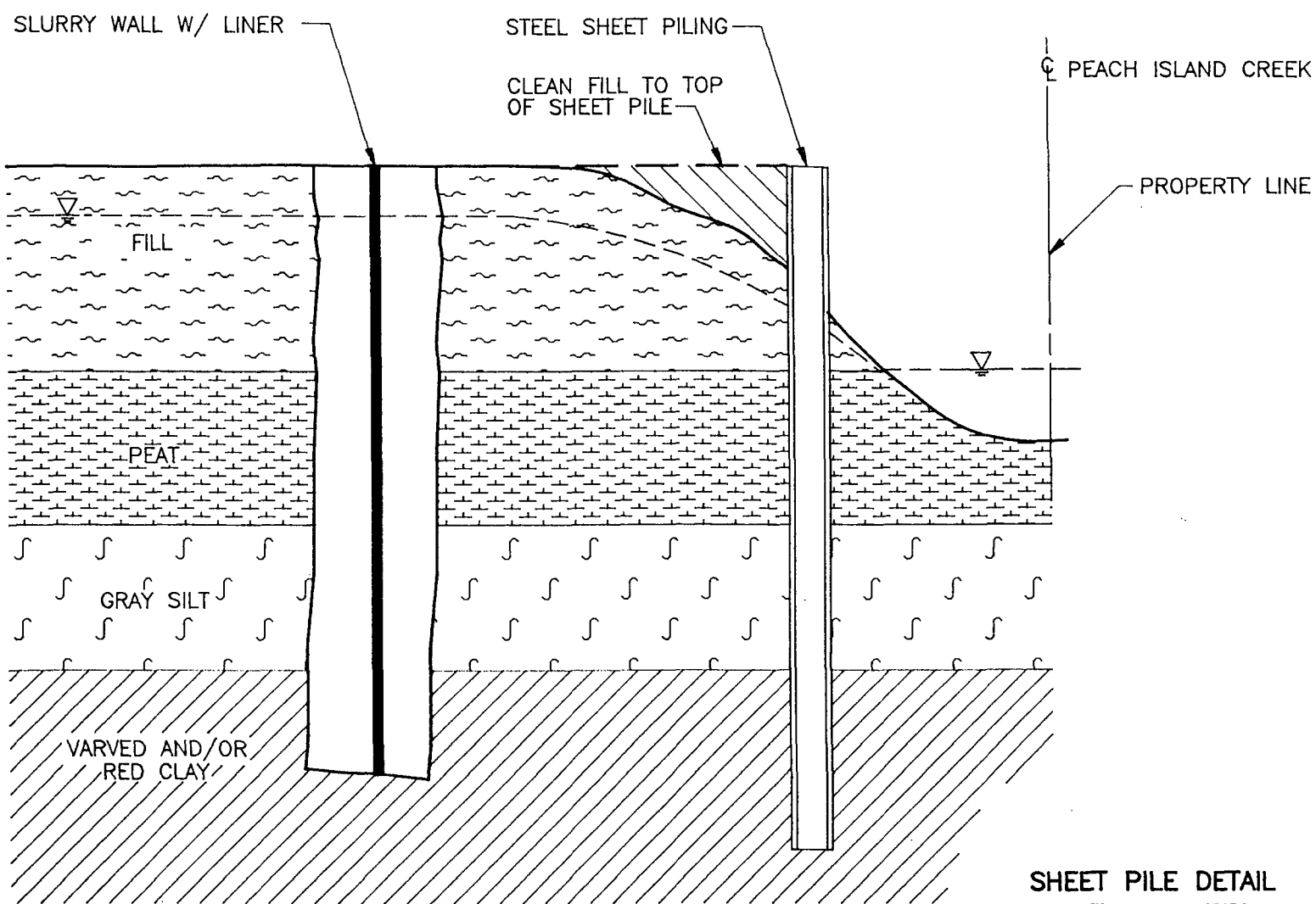
△	3/21/91	ISSUED FOR AGENCY REVIEW	J.M.R.	SDP	BS
△	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
△	12-6-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
△	11-27-90	ISSUED FOR CLIENT REVIEW	WLH	S.D.P.	
No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY

DATE: 11-19-90  
SCALE: N.T.S.

FIGURE 7-4

DRAWING NUMBER  
90-198-A17

DRAWING NUMBER  
90-198-A9



SHEET PILE DETAIL  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

PREPARED FOR  
COOPERATING PRP GROUP  
**Canonie** Environmental

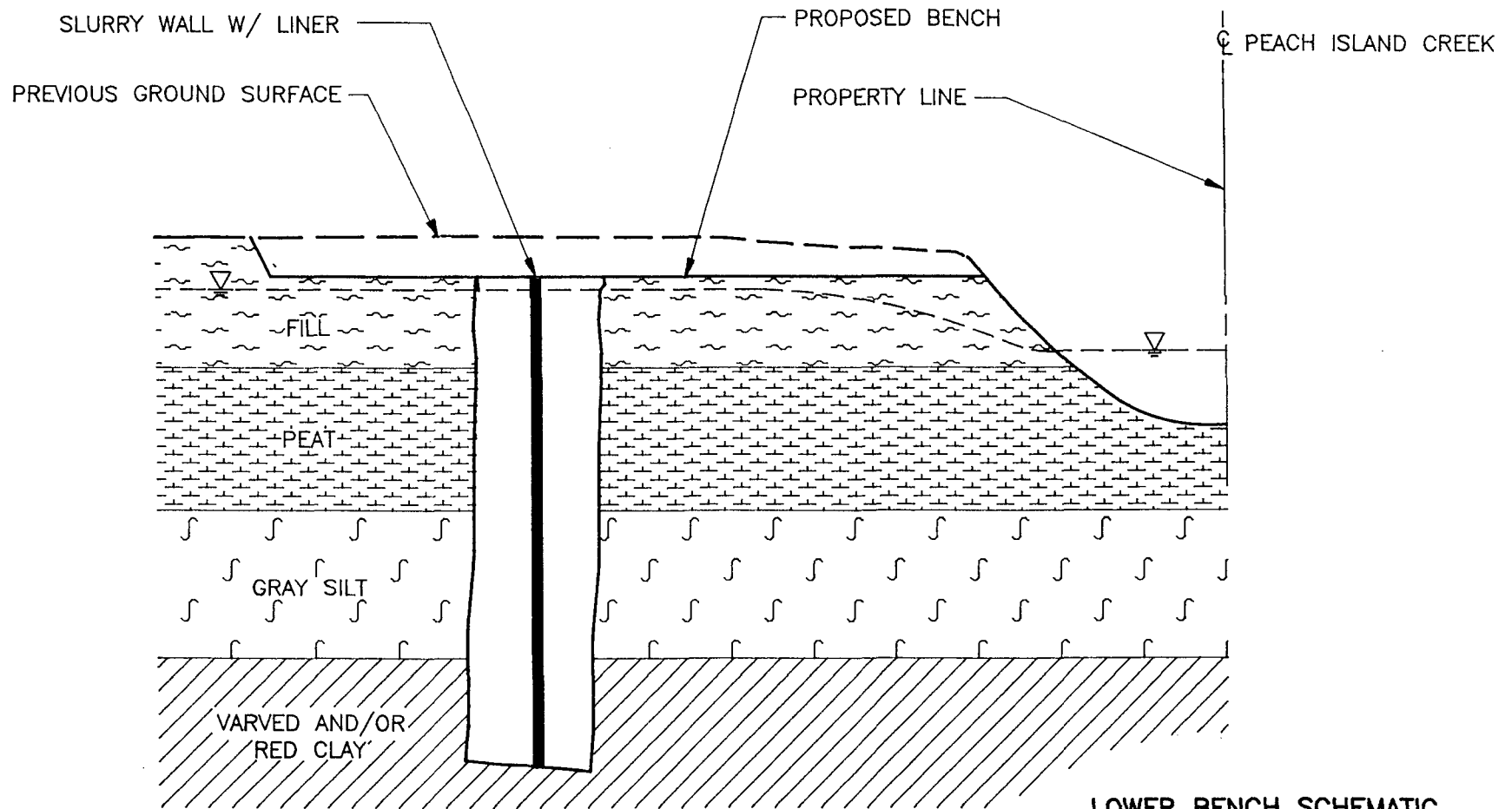
**LEGEND:**  
▽ WATER LEVEL

4	3/21/91	ISSUED FOR AGENCY REVIEW	WLH	SDP	2
3	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
2	12-6-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
1	11-27-90	ISSUED FOR CLIENT REVIEW	WLH	S.D.P.	
No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY

DATE: 11-16-90	FIGURE 7-5	DRAWING NUMBER 90-198-A9
SCALE: N.T.S.		

100379

DRAWING  
NUMBER  
90-198-A10



LOWER BENCH SCHEMATIC  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

PREPARED FOR

COOPERATING PRP GROUP

**Canonie**Environmental

**LEGEND:**

▽ WATER LEVEL

4	3/21/91	ISSUED FOR AGENCY REVIEW	WLH	SDP	BS
3	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
2	12-6-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
1	11-29-90	ISSUED FOR CLIENT REVIEW	WLH	S.D.P.	
No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY

DATE: 11-18-90  
SCALE: N.T.S.

FIGURE 7-6

DRAWING NUMBER  
90-198-A10



APPENDIX A  
RESUMES OF KEY PERSONNEL

**JOHN J. GROCKI**  
**Vice President - Eastern Operations**

---

**EDUCATION AND REGISTRATIONS**

MBA, Finance, Stanford University  
MS, Chemistry, California Institute of Technology  
BS, Chemistry, Worcester Polytechnic Institute

**PROFESSIONAL EXPERIENCE****Project Management and Administration**

Responsible for all of Canonie's operations in the United States Environmental Protection Agency Regions I, II, and III which currently includes:

- o Twenty-three projects up to \$30 million in size;
- o Projects ranging in scope from land-transfer investigations and Remedial Investigation/Feasibility Study work to complete remediation of Superfund sites;
- o Active projects at seven Superfund sites including significant remediation activities at Cannons Engineering in Bridgewater, Massachusetts, Gloucester Environmental Management Services (GEMS) in Gloucester Township, New Jersey, Sinclair Refinery in Wellsville, New York, and Hudson River Remnant Deposit project in Fort Edward, New York;
- o Remedial Investigation/Feasibility Study and Remedial Design work on 14 sites.

**Construction and Materials Handling**

Design and/or construction of ground water containment and remediation systems

Design and/or construction of landfill caps at several major sites

Experience in the design and construction of port facilities and materials handling systems for mining and marine transport

**Technical Expertise and Assessments**

Expert witness on a number of proceedings before regulatory boards and courts

Analyses of a number of major ventures in land use, transportation, mining, and materials handling

**JOSEPH E. MIHM**  
**Project Manager**

---

**EDUCATION AND REGISTRATIONS**

ME, Civil Engineering, Clarkson College of Technology  
BS, Civil Engineering, Clarkson College of Technology

PE: CA, CO, NY

**PROFESSIONAL EXPERIENCE**

**Project Management and Administration**

Managed and directed remedial investigations at sites with soils and ground water impacted by chlorinated organic solvents and PCBs  
Managed construction of ground water, leachate, and wastewater collection and treatment plants and wastewater transmission systems  
Directed project activities for remedial investigations/feasibility studies, work plan and design presentation, and construction implementation

**Regulatory Negotiations**

Developed and obtained approval of RI/FS and RD/RA work plans at Superfund sites and closure plans for RCRA facilities  
Interacted extensively with local, county, and state regulatory agencies for securing permits and construction authorizations

**Ground Water Extraction and Treatment**

Designed and installed ground water control containment and extraction systems and soil/ground water flushing systems  
Designed and constructed ground water and wastewater treatment systems using air stripping, activated carbon, filtration, chlorination, and chemical oxidation  
Directed remedial investigation activities to determine the existence, magnitude, and extent of ground water contamination, including extensive ground water modeling

**Remedial Technology Assessments**

Prepared site-specific work plans including RI/FS, RD/RA, health and safety, and QA/QC plans for Superfund sites  
Evaluated and designed remedial alternatives for soils impacted by volatile organics  
Designed and constructed HDPE synthetic liners for emergency holding tanks for industrial wastewater  
Prepared plans and specifications for chemical storage areas and petroleum storage facilities  
Prepared spill prevention and contingency plans for major bulk petroleum storage facilities

**JERRY K. SNYDER, P.E.**  
**Project Supervisor**

---

**EDUCATION AND REGISTRATIONS**

MS, Civil Engineering, Colorado State University  
BS, Mathematics and Chemistry, University of Michigan

PE: PA

**PROFESSIONAL EXPERIENCE**

**Project Management and Administration**

Project Supervisor directing technical staff on remedial investigations, feasibility studies, design work, and construction implementation  
Oversight on the selection and application of on-site treatment technologies

**Ground Water Modeling**

Integrated ground water computer models with a data base management system of environmental samples and analytical data  
Developed computer models for ground water and surface water systems. Models were used to evaluate environmental management decisions at contaminated ground water and surface water sites  
Calibrated ground water flow model to determine the effect of well pumping on ground water movement in a valley sediment aquifer

**Surface Water Hydrology**

Calibrated surface water quality models to over 25 surface water-body systems. Calibrated models were used as the basis for management decisions regarding waste-loads to these water-bodies  
Used Exposure Analysis Modeling System (EXAMS) to evaluate environmental chemistry and fate of several hazardous substances in surface water systems

**Environmental Impact Assessments**

Performed biological assessment to evaluate potential impacts to a lake from a proposed thermal discharge

**Information Management Systems**

Developed an interface between an extensive Information Management System containing geophysical and geohydrologic data with a library of 12 groundwater models

**Risk Assessments**

Performed analyses of contaminant movement and transformation through various environmental pathways in support of risk assessment activities  
Evaluated the effect of alternative remedial measures on containment movement through environmental pathways

100385

**Canonie**Environmental

## **EDUCATION AND REGISTRATIONS**

MS, Civil Engineering, Carnegie-Mellon University  
BS, Civil Engineering, Carnegie-Mellon University

PE: CA, CO, MA, NJ, PA, CT, NY, RI

## **PROFESSIONAL EXPERIENCE**

### **Project Management and Administration**

Project manager directing technical staff on investigations, feasibility studies, design work, and construction implementation  
Oversight of the selection and application of on-site treatment technologies for Superfund, RCRA, and New Jersey ECRA facilities

### **Regulatory Negotiations**

Preparation and successful negotiations of applications for RCRA Part B and NPDES permits  
Regulatory negotiations and implementation of work plans and remedial design under RCRA, CERCLA, and New Jersey ECRA

### **Remedial Technology Assessments**

Development of surface impoundment and landfill closure plans under clean, dirty, and hybrid closure scenarios  
Investigation and design of Class I surface impoundments and landfills meeting RCRA minimum technology standards; detailed site planning for closing and/or retrofitting a Class I hazardous waste management facility  
Nuclear waste repository instrumentation installation, data evaluation, and reporting  
Investigation, selection, and implementation of on-site chemical stabilization programs  
Underground storage tank removal and remediation of hydrocarbon contamination of soil and ground water  
Preparation of site-specific plans including health and safety, quality assurance/quality control, and operations plans  
Evaluation of technologies for on-site remediation including bioremediation, soil flushing, chemical treatment, and vacuum extraction

### **Construction and Materials Handling**

Construction supervision of site cleanups for landfills, surface impoundments, underground storage tanks, soil, and ground water  
Overseeing the fabrication of an air supported structure to be used for emissions control during waste excavation

**DAEKYOO HWANG, Ph.D., P.E.**  
**Senior Staff Consultant**

---

## **EDUCATION AND REGISTRATIONS**

Ph.D, Geotechnical Engineering, University of Maryland  
 MS, Geotechnical Engineering, University of Maryland  
 BS, Civil Engineering, Seoul National University, Korea  
 PE: CA, DE, PA, VA

## **PROFESSIONAL EXPERIENCE**

### **Project Management and Administration**

Project Manager for a number of Superfund RI/FS projects, RCRA closure of landfills and surface impoundments, technical and regulatory support for NPL site PRPs, RCRA corrective action, and voluntary site remediation projects.

Directed technical staff, developed key regulatory and technical strategies, coordinated multi-disciplinary tasks and integrated key project elements toward cost-effective liability control.

### **Technical Expertise**

Multi-disciplinary technical expertise in site remediation with capabilities to streamline complex project components into a simple, critical framework upon which practical and cost-effective solutions are devised  
 Geoenvironmental engineering experience including cap design, containment systems, slurry walls, geosynthetics, sludge stabilization, and earth structures  
 Geohydrology experience including geohydrologic assessment, flow and transport modeling, dewatering, ground water control, water balance  
 Construction experience including earthwork planning, construction methods, sludge dewatering, cost estimate, scheduling  
 Other experience includes environmental risk assessment, computer methods, and statistics and probability

### **Development of Cost-Effective Site Remediation Technologies**

Value-Engineered Cap Design - Combines high-performance, cost-effective cap components in a synergistic manner to achieve the RCRA cap performance for 40 to 50 percent less cost.  
 Geotechnical Sludge Stabilization - Stabilizes sludges for \$5 to \$12 per cubic yard (instead of typical solidification for \$20 to \$50 per cubic yard) by in-situ dewatering based on geosynthetics drainage material and vacuum overconsolidation. Other equally effective technologies include accelerated evaporation and tar sludge viscosity control, depending on the sludge and site conditions.  
 Horizontal Drains and Wellpoints - A unique dewatering method (to control ground water for waste isolation, to collect leachate or to recover contaminated ground water) replacing other expensive remedial components at a fraction of typical costs and schedule.

**ROBERT C. REICHERT**  
**Vice President - Construction Services**

---

**EDUCATION AND REGISTRATIONS**

BS, Civil Engineering, University of Dayton

PE: MI, OH

**PROFESSIONAL EXPERIENCE**

**Project Management and Administration**

Twenty-one years of construction management experience

Construction supervisor on several major hazardous waste remediation projects

Construction manager for the coordination of the entire design, bid, construction, and startup effort of water treatment facilities at 10 power plant locations

Responsible for bid package preparation and scope definition, budget estimating, schedule analysis, and preparation and coordination of major equipment purchases

Conduction of value engineering reviews, review of designs for constructability input, and analyzed construction problems and proposed solutions

Project manager on several major projects including slurry wall construction and ground water interceptor trench construction

Extensive experience in project estimating

Extensive experience in CPM scheduling

Extensive experience in project cost control

**Ground Water Extraction and Treatment**

Project manager on projects including ground water interceptor trench construction

Extensive experience in construction of ground water extraction, treatment, and infiltration projects

**Soil Remediation**

Extensive experience in the removal and disposal of contaminated soils

**Construction and Materials Handling**

Concrete foundation construction experience

Experience in major earthmoving projects

Experience in underground utility construction

Experience in major demolition projects, including building demolition and underground utility removal

**CLAYTON A. BOCK**  
**Regional Health and Safety Coordinator**

---

**EDUCATION**

BS, Environmental Health, Illinois State University

**PROFESSIONAL EXPERIENCE****Health and Safety Expertise**

Supervising on-site health and safety staff at various projects in the United States Environmental Protection Agency (EPA) Region I, II, and III

Writing safety plans for hazardous wastes sites

Preparing estimates for health and safety costs for prospective jobsites

Conducting site inspections for compliance with all 29, 40, and 49 Code of Federal Regulations

Conducting all types of air monitoring utilizing direct reading instruments, gas chromatography

Performing air sampling in accordance with NIOSH, EPA, and OSHA methodology

Coordinating air sampling analysis with laboratories and reviewing and interpreting the data generated

Writing correspondence regarding health and safety issues to both clients and governmental agencies

Responsible for employees medical monitoring to ensure compliance with medical standards for hazardous waste site remediation

Conducting 8-hour and 40-hour OSHA training

Conducting eight-hour first aid and CPR training

**Related Experience**

Experience also gained by writing the laboratory manual used by HSC/IT 359, "Quantitative Occupational Health;" completing a self-study course, "Waterborne Disease Control;" and completing an internship in industrial hygiene

Several years of experience in various supervisory capacities in the construction industry which contributed to a strong understanding of industry contingencies and concerns

100389

**Canonie**Environmental

**DAVID A. DEKKER**  
**Construction Manager**

---

**EDUCATION**

West Shore Community College

**PROFESSIONAL EXPERIENCE****Project Management**

Over 25 years of experience as a field and project superintendent to Canonie with projects involving dredging, site grading, dewatering, foundations, riprap, dike work, ground water restoration using subsurface drainage cutoff trench drains, slurry wall construction, air filtration, and pipe treatment systems

Expertise relative to the use, maintenance, and scheduling of on-site heavy equipment proved critical to the successful and timely completion of numerous projects including hazardous waste clean-up projects throughout the state of California

Involvement in all aspects of project/construction management, including bidding on projects, keeping accurate records, and tracking the costs of each project

Extensive experience in accommodating construction and equipment scheduling to the requirements of on-site health and safety protocols and protection of the surrounding environment

Performance in various capacities pertaining to an array of multidisciplinary projects, including the following:

- o Completely in charge of all construction aspects of a major landfill project, which involved the closing of 39 holding ponds and removal of 1,000,000 yards of contaminated material into the landfill under strict health and safety monitoring
- o Responsible for removal of soil containing pesticides and metals on a project in California
- o Involved, as Construction Supervisor, with the installation of treating systems for plating processes for a major corporation at two sites in California
- o Functioned as Site Superintendent for numerous semiconductor corporation projects which involved removal of sludge pits, chemical tanks, and installation of extraction trenches with slurry walls built in several of these projects
- o Responsible, as Canonie's On-site Superintendent at numerous projects throughout the Midwest, for coordination and scheduling of projects that involved site grading, road construction, channel excavation, underground drains, and other heavy earthwork

100390

**Canonie**Environmental

**FRANK J. GONTOWSKI**  
**Assistant Project Engineer**

---

**EDUCATION AND REGISTRATIONS**

MS, Civil Engineering, Drexel University (6 credits required for completion)  
BS, Civil Engineering, Drexel University

Engineer-in-Training: PA

**PROFESSIONAL EXPERIENCE**

**Technical Expertise**

Management of geotechnical instrumentation installation and soil sampling for  
USACE dike construction at Wilmington Harbor

Implementation and performance of laboratory soil testing procedures for clay cap  
at GEMS Superfund Site

Well installation for ground water monitoring and piezometric level determination

Site inspection, concrete and steel construction; also, inspection of deep and  
shallow foundation construction, including caissons, cofferdams, piles, and mats

Geotechnical and structural design

Technical report, proposal, and correspondence preparation

Design and construction of geosynthetic installations utilizing geotextiles,  
geogrids, geomembranes, geonets, and geocomposites

Computer programming and software utilization for aiding in design, data  
reduction, planning, and scheduling

Determination of laboratory soil properties using triaxial, flexible wall  
permeameter, consolidometer, and other geotechnical testing equipment

In-place nuclear density testing

Level B, C, and D site reconnaissances

**RICHARD J. GREENWOOD**  
**Regional Operations Manager**

---

**EDUCATION AND REGISTRATIONS**

MS, Geotechnical Engineering, Utah State University  
 BS, Civil Engineering, Utah State University

PE: CA, CO

**PROFESSIONAL EXPERIENCE**

**Project Management and Administration**

Supervision and direction of project supervisors, project engineers, reproduction and administration personnel, field technicians, and construction personnel on RI/FS, remedial design, work plan preparation, and construction implementation  
 Cost and accounting control of large-scale remedial investigation and construction projects for both governmental and industrial clients

**Regulatory Negotiations**

Negotiation of large-scale engineering and construction contracts with U.S. Navy and California Department of Health Services Toxic Substance Control Division  
 Site-specific assistance provided to responsible parties in negotiation funding, Consent Decrees, remedial action, and NPDES permit requirements

**Ground Water Extraction and Treatment**

Design/construction of remedial action to control/extract ground water impacted by oils, VOCs, metals, PNAs, and PCBs using extraction wells, trenches, and soil flushing systems  
 Treatment of water using air stripping, activated carbon, chemical oxidation, precipitation, biological methods, filtration, and gravity separation  
 Hydrologic analysis and hydraulic design of ditches and conveyance structures for control of surface water for large surface coal mines

**Construction and Materials Handling**

Construction cost control and preparation of construction drawings and specifications  
 Construction supervision on numerous site cleanups for landfills, surface impoundments, industrial sites, and mining locations and the installation of leachate collection systems, slurry walls, clay liners, clay caps, and containment vaults.

**Remedial Technology Assessments**

Investigation, design, and construction of disposal facilities for waste products originating from underground and surface coal mines, uranium processing, trona mines, and gold and silver production  
 Evaluation of technologies for on-site remediation using thermal separation, in-situ stabilization, bioremediation, soil flushing, vacuum extraction, and chemical treatment  
 Geotechnical and structural engineering of underground facilities in salt beds and on volcanic Basalts for the disposal of high-level radioactive wastes

**Canonie Environmental**

**STEPHEN D. PIERCE**  
**Project Engineer**

---

**EDUCATION AND REGISTRATIONS**

MS, Chemical Engineering, Drexel University  
BS, Chemical Engineering, Drexel University  
BS, Applied Mathematics and Astronomy, Penn State University  
Engineer-in-Training: Pennsylvania

**PROFESSIONAL EXPERIENCE**

**Ground Water Extraction and Treatment**

Assisted with construction and start up of a ground water treatment plant on Long Island, New York. Contaminants were predominately volatile to semi-volatile organics. The plant processed 1400 gpm using 8 air stripping towers, pressure filtration, and liquid and vapor phase carbon filters

Completed initial design phase for gas treatment plant to destroy a contaminated landfill gas

Designed and set specifications for 160 gpm ground water treatment facility at a Superfund site located in King of Prussia, Pennsylvania. The design used biological fixed film reactors followed by pressure filtration, liquid phase and vapor phase carbon. The process also included chemical additions to prevent undesired microbial growth, to improve clarifier efficiency, and aid filter press operation.

**Unit Operations Research**

Eleven years experience performing pilot plant work with on-line centrifugal separators, which included decanter, basket, disc, and liquid-liquid separator designs

Performed on-site testing and installation of centrifugal equipment at municipal and industrial waste treatment plants, coal processing, and food production plants

**Modeling Calculations**

Performed calculations for modeling a cylindrical containment vessel of thorium waste solids to determine dosage rates versus distance from the vessel

Designed computer programs which would predict centrifugal performance as process variables were changed

100393

**Canonie**Environmental

**ROMAN S. POPIELAK**  
**Senior Technical Manager**

---

**EDUCATION AND REGISTRATIONS**

MS, Mining Geology Engineering, Academy of Mining and Metallurgy, Poland  
BS, Mining Geology Engineering, Academy of Mining and Metallurgy, Poland

CPGS  
Licensed Idaho Water Well Driller

**PROFESSIONAL EXPERIENCE****Project Management and Administration**

Direction of project teams on remedial investigations/feasibility studies, project design, construction, and start-up phases of the projects  
Selection and supervision of subcontractors to work at many hazardous waste sites throughout the country  
Cost and schedule control of large construction projects  
Expert witness on hydrogeological issues

**Regulatory Negotiations**

Client assistance in negotiations of acceptable terms of Consent Decrees for RD/RA work, negotiations of ground water remedial action programs  
Negotiations of work plans for sites in the remediation phase and attainment of all operating permits needed for remedial activities

**Ground Water Extraction and Treatment**

Investigation of ground water contamination, definition of sources and pathways of contaminant migration  
Selection of methods to remediate ground water and soil contaminated with organics and heavy metals  
Design and construction of ground water extraction and infiltration systems using extraction well and interceptor trenches

**Construction and Materials Handling**

Construction supervision of remediation project components for containment of the contamination plume  
Installation of slurry walls, well barriers, evaporation systems, dewatering systems

**Remedial Technology Assessments**

Evaluation of methods for ground water remediation including extraction, flushing, soil ventilation, in-situ restoration  
Experienced in engineering, design, and construction of systems to contain seepage of uranium tailings

**MICHAEL J. STREBECK**  
**Project Supervisor - Estimator**

---

**EDUCATION**

BS, Civil Engineering, University of Michigan

**PROFESSIONAL EXPERIENCE**

**Project Management and Administration**

Acquired an extremely broad-based background in the managing and implementation of specialty construction projects

Completed numerous projects, primarily in the heavy construction industry where he has functioned in several roles such as field engineer and field superintendent with responsibilities ranging from project engineer to project estimator

Involved in the construction of major civil projects, including the installation of specialty foundations for power plants, major paper mill expansions, large manufacturing buildings, plant modifications, and specialty industrial applications

Practices specific areas of specialization including surveying, high capacity foundations, specialty piling and sheeting, ground freeze retention, production analysis of earth moving and handling equipment, and slurry wall installation for ground water control

**Technical Expertise and Assessments**

Completed several specialty foundation support system projects for the automotive industry, including the estimating, contract negotiations, supervision of the field installation, and field cost tracking and billing

Involved with the organization and installation of slurry wall systems for the control of ground water or remediation projects including both conventional soil/bentonite slurry walls and vibrated beam grout/bentonite walls

Plays an integral role with the cost estimation and implementation of remedial work activities and has been directly involved with the preparation of proposals, the development of cost estimates and project schedules, the interfacing with clients and subcontractors, and the implementation of field construction activities

Utilizes several computer software packages in the estimation, scheduling, and cost tracking of construction projects

**CHRISTIAN A. ten BRAAK**  
**Field Technician**

---

**EDUCATION AND REGISTRATIONS**

BA, Geography, Bucknell University

**CERTIFICATIONS**

OSHA 40-Hour Hazardous Materials Training, 1989

**SPECIALTY AREAS**

Ground water well development on hazardous waste site

**PROFESSIONAL EXPERIENCE**

**Technical Expertise**

Air Monitoring Technician during remedial action on Superfund site

Health and Safety officer for individual work areas, including oversight of decontamination procedure

Soil sampling and testing; extensive work on clay cap and drainage sands at GEMS Superfund site

Quality Assurance/Quality Control during drilling and well abandonments

Oversight and implementation of groundwater well development on hazardous waste sites

Quality Assurance/Quality Control installation of geo-synthetic membrane liner

APPENDIX  
B

APPENDIX B  
HEALTH AND SAFETY PLAN AMENDMENTS

SITE SAFETY PLAN AMENDMENT #

SITE NAME:

DATE:

TYPE OF AMENDMENT:

REASON FOR AMENDMENT:

ALTERNATE SAFEGUARD PROCEDURES:

CHANGES IN PERSONNEL PROTECTIVE EQUIPMENT:

---

Site Safety Officer

---

Date

---

Project Manager

---

Date

---

Regional Health & Safety Coordinator

---

Date

APPENDIX  
C

APPENDIX C  
HEAT AND COLD STRESS

100402

## APPENDIX C

### HEAT AND COLD STRESS

#### Heat Stress

The heat stress of employees on-site will be monitored by direct observation of employees and by environmental measurements, such as the Wet Bulb Globe Temperature Index (WBGT). This method will require the use of a heat stress monitoring device, such as the Wibget Heat Stress Monitor (Reuter Stokes) or globe, dry, and wet bulb thermometers.

The WBGT shall be compared to the TLV outlined in the ACGIH TLV booklet and a work-rest regimen will be established, as deemed necessary, by the SSO. In general, five degrees must be subtracted from the listed TLV for heat stress to compensate for the wearing of impermeable protective clothing. Other published environmental or physiological indices, such as the Heat Stress Index or Effective Temperatures, may be used by the SSO in establishing tolerance limits and work/rest regimens.

A combination of the following control measures shall be used to help control heat stress:

- o Provision of adequate liquids to replace lost body fluids. Employees must replace water lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate fluid replacement. Water and Gatorade may be used.
- o Establishment of a work regimen that will provide adequate rest periods for cooling down. This may require additional shifts of workers.
- o Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.

- o All breaks are to be taken in a cool or shaded rest area (77 degrees Fahrenheit is best).
- o Employees shall remove impermeable protective garments during rest periods.
- o Employees shall not be assigned other tasks during rest periods.
- o All employees shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

During periods of high temperature and/or humidity, the site HSO and his/her representative will continually observe the workers for symptoms of heat stress, especially in areas where protective clothing is being worn. If the body's physiological processes that maintain a normal body temperature fail, or are overburdened due to excessive heat exposure, a number of physical reactions can occur ranging from mild symptoms such as fatigue, irritability, anxiety, decreases in concentration and movement and death. Heat-related problems are presented below:

1. Heat Rash - This caused by continual exposure to heat and humid air, and aggravated by chafing clothes. Heat rash decreases a person's ability to tolerate heat as well as becoming an irritating nuisance.
2. Heat Cramps - This is caused by profuse perspiration with inadequate water intake and chemical electrolyte imbalance. This results in muscle spasm and pain in the extremities and abdomen.
3. Heat Exhaustion - Increased stress on various organs to meet increasing demands and symptoms including shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.

4. Heat Stroke - This is the most severe form of heat stress which must be treated immediately by cooling the body or death may result. Signs and symptoms include red, hot, dry skin; no perspiration; nausea; dizziness and confusion, strong, rapid pulse, and coma.

### Cold Stress

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body which have high surface-area-to-volume ratio such as fingers, toes, and ears are the most susceptible.

Two factors influence the development of a cold injury; ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10 degrees Fahrenheit with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18 degrees Fahrenheit.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

Frost nip or initial frostbite: Characterized by suddenly blanching or whitening of skin.

Superficial frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

Deep frostbite: Tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages: 1) shivering, 2) apathy, listlessness, sleepiness, and (sometimes rapid cooling of the body to less than 95 degrees Fahrenheit, 3) unconsciousness, glassy state, slow pulse, and slow respiratory rate, 4) freezing of the extremities, and finally 5) death.

Thermal socks, long cotton or thermal underwear, hard hat liners and other cold weather gear can aid in the prevention of hypothermia.

Blankets, warm drinks (other than caffeinated coffee) and warm break areas are essential.

Measures should be taken to keep workers from getting wet such as issuance of rain gear. Workers whose clothes become wet shall be given the opportunity to dry off and change clothes.

Cold stress training shall be addressed during the site-specific training.

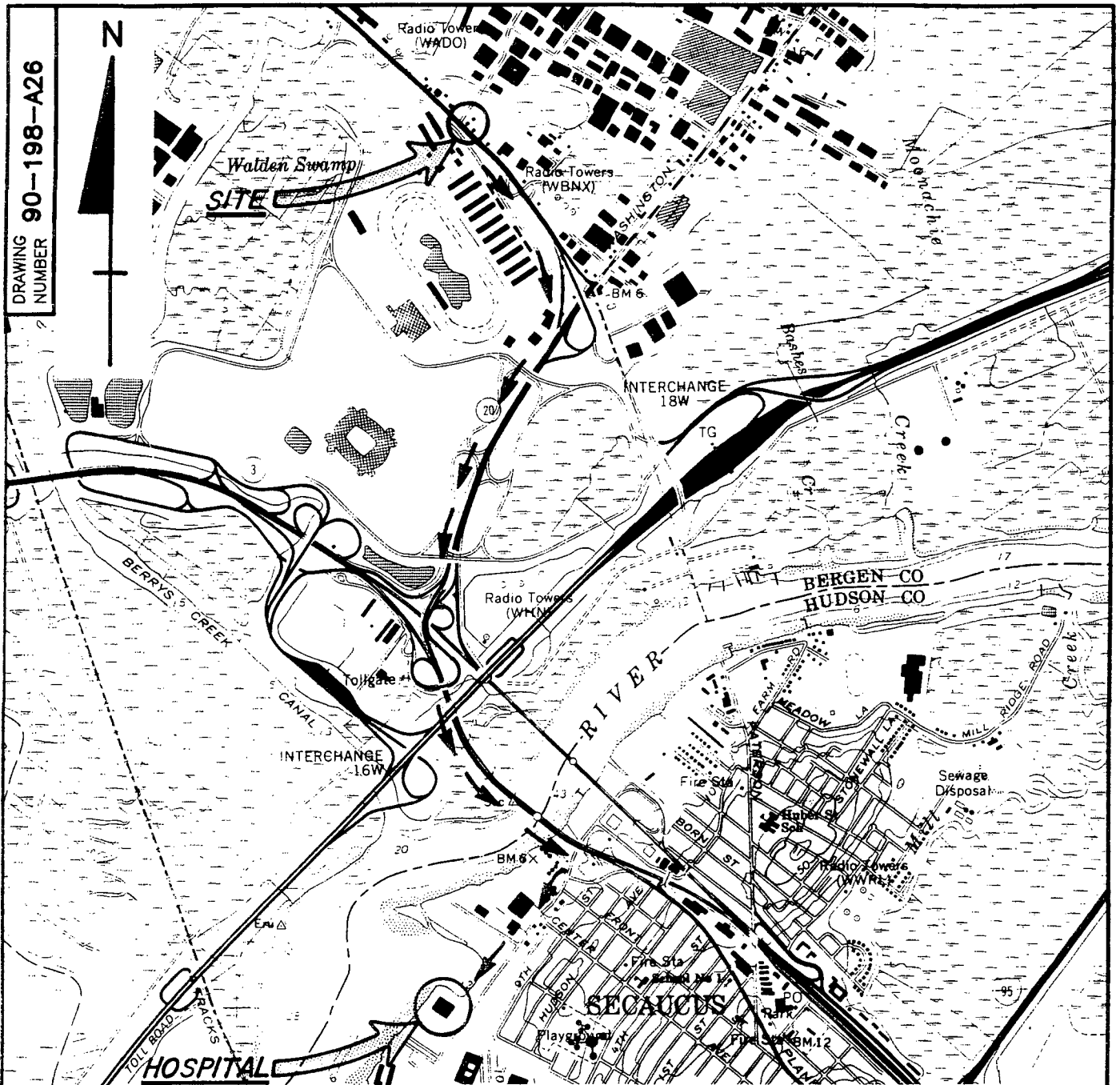
APPENDIX  
D

APPENDIX D  
MAP OF DIRECTIONS TO NEAREST HOSPITAL

100408

**Canonie**Environmental

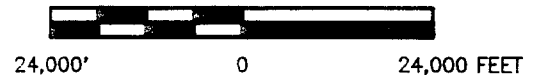
DRAWING NUMBER 90-198-A26



REFERENCES:

-USGS 7.5 MINUTE WEEHAWKEN QUADRANGLE  
NEW JERSEY-NEW YORK  
SCALE: 1"=24,000'  
DATE 1967, PHOTOREVISED 1981

APPROXIMATE SCALE



MAP OF DIRECTIONS  
TO NEAREST HOSPITAL  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

PREPARED FOR  
COOPERATING PRP GROUP  
**Canonic** Environmental

△	3/21/91	ISSUED FOR AGENCY REVIEW	JMR	SDP	JKS
△	3/15/91	ISSUED FOR CLIENT REVIEW	WLH	JS	
△	2/6/90	AGENCY REVIEW	WLH	SDP	JKS
△	11/27/90	CLIENT REVIEW	WLH	SDP	
No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY

DATE: 11-26-90  
SCALE: AS SHOWN

FIGURE D-1

DRAWING NUMBER  
90-198-A26

100409

APPENDIX  
E

APPENDIX E  
HEALTH AND SAFETY PLAN  
ACKNOWLEDGEMENT FORM

100411

**Canonie**Environmental

## HEALTH AND SAFETY PLAN ACKNOWLEDGMENT FORM

I have been informed, understand, and will abide by the procedures set forth in the Health and Safety Plan (Section 4) Appendices B, C, and D, Tables 4-1, 4-2, and 4-3, and Figure 2-3 for the Site at 216 Paterson Plank Road in Carlstadt, New Jersey.

[illegible]

100412

# TRAINING AND MEDICAL MONITORING WAIVER FORM

I, \_\_\_\_\_, an employee of \_\_\_\_\_  
\_\_\_\_\_ will be conducting work and or entering the  
exclusion zone (circle which is applicable) at the \_\_\_\_\_  
\_\_\_\_\_ site located in \_\_\_\_\_  
\_\_\_\_\_. I understand that site operations for this  
project are covered by OSHA 29 CFR 1910.120 and training and medical  
monitoring are required for those persons exposed or potentially exposed to  
hazardous substances.

I, hereby request that the requirements marked below by my initials be  
waived.

40-Hour hazardous waste training	_____
24-Hour hazardous waste training	_____
Asbestos training	_____
Medical monitoring	_____
Other; _____	_____

I request that the requirements I have initialed above be waived because I  
will be conducting the following activities at the site: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I have met with the Site Safety Officer and reviewed the Site Health and  
Safety Plan requirements and agree to follow all site operating procedures.

\_\_\_\_\_  
Name

\_\_\_\_\_  
Date

\_\_\_\_\_  
Site Safety Officer Approval

\_\_\_\_\_  
Date



APPENDIX F

SUMMARY OF CHEMICAL DATA

(Data Taken from Tables 1 through 11 of the  
Record of Decision dated September 14, 1990)

100415

**Canonie**Environmental

SUMMARY OF CHEMICAL CONCENTRATIONS  
IN SHALLOW SOIL (0-2') SAMPLES

CHEMICAL (Concentration Units)	FREQUENCY OF DETECTION	MAXIMUM DETECTED CONCENTRATION	GEOMETRIC MEAN CONCENTRATION
Volatile Organic Compounds (ug/kg)			
Benzene	4/17	53,900	90
Chlorobenzene	4/17	336,000	128
Chloroform	4/17	17,800	44
1,1-Dichloroethane	2/17	64,700	72
1,2-Dichloroethane	4/17	10,200	60
1,1-Dichloroethylene	2/17	182	10
1,2-trans-Dichloroethylene	5/17	241	9
Ethylbenzene	7/17	652,000	384
Methyl ethyl ketone	2/17	8,560	104
Methylene chloride	11/17	2,390	143
1,1,2,2-Tetrachloroethane	1/17	476	NC
Tetrachloroethylene	12/17	4,290,000	934
Toluene	8/17	3,380,000	739
1,1,1-Trichloroethane	1/17	1,228	NC
1,1,2-Trichloroethane	2/17	1,810	31
Trichloroethylene	12/17	2,060,000	270
m-Xylene	7/17	2,000,000	734
o-p-Xylenes	9/17	1,430,000	823
Semi-Volatile Compounds (ug/kg)			
Acenaphthene (NC)	9/17	2,700	339
Anthracene (NC)	9/17	3,910	392
Benzo(a)anthracene (C)	5/17	4,540	1,060
Benzo(a)pyrene (C)	9/17	9,390	836
Benzo(b)fluoranthene (C)	6/17	17,700	1,990
Benzo(g,h,i)perylene (NC)	6/17	6,950	851
Benzo(k)fluoranthene (C)	1/17	3,790	NC
Bis-(2-ethylhexyl)phthalate	17/17	281,000	33,600
Butyl benzyl phthalate	8/17	48,304	1,540
2-Chloronaphthalene	2/17	122,000	174
Chrysene (C)	11/17	5,500	753
Dibenzo(a,h)anthracene (C)	3/17	2,400	693
1,2-Dichlorobenzene	8/17	47,300	543
2,4-Dichlorophenol	1/17	1,102	NC
2,4-Dimethylphenol	2/17	1,120	188
Diethylphthalate	1/17	4,994	NC
Di-n-butyl phthalate	13/17	71,000	3,080
Di-n-octyl phthalate	6/17	9,050	1,570
Fluoranthene (NC)	16/17	19,300	1,850
Fluorene (NC)	8/17	6,909	428
Indeno-(1,2,3-c,d)pyrene (C)	6/17	12,100	1,010
Naphthalene (NC)	16/17	102,000	2,020
Nitrobenzene	1/17	78,299	NC
N-Nitrosodiphenylamine	3/17	2,980	245
Phenanthrene (NC)	13/17	15,300	2,120
Phenol	4/17	58,200	145
Pyrene (NC)	19/17	12,700	1,800
1,2,4-Trichlorobenzene	2/17	1,228	152

**SUMMARY OF CHEMICAL CONCENTRATIONS  
IN SHALLOW SOIL (0-2') SAMPLES**

<b>CHEMICAL (Concentration Units)</b>	<b>FREQUENCY OF DETECTION</b>	<b>MAXIMUM DETECTED CONCENTRATION</b>	<b>GEOMETRIC MEAN CONCENTRATION</b>
<b>Pesticides/PCBs (ug/kg)</b>			
Aldrin	3/17	57,000	44
Dieldrin	5/17	57,000	170
PCBs:			
Aroclor 1242	11/17	15,000,000	2,680
Aroclor 1248	4/17	23,000	345
Aroclor 1260	2/17	48,000	351
Aroclor 1254	3/17	12,000	579
<b>Inorganic Chemicals (mg/kg)</b>			
Antimony	3/17	16	3.8
Arsenic	14/17	60	8.1
Beryllium	17/17	26	0.36
Cadmium	17/17	95.1	6.1
Chromium	17/17	721	78.5
Copper	17/17	71,600	2,320
Cyanide	16/17	5.02	1.85
Lead	17/17	2,750	490
Mercury	17/17	21.3	1.4
Nickel	15/17	39	12.2
Selenium	5/17	4.9	0.49
Silver	7/17	19	1.1
Zinc	17/17	4,170	398

ND = Not detected.

NC = Not calculated since chemical was detected in only one sample.

(C) = Carcinogenic PAH.

(NC) = Noncarcinogenic PAHs.

SUMMARY OF CHEMICAL CONCENTRATIONS  
IN MEDIUM DEPTH (5-6') SOIL

F-3

Chemical (Concentration Units)	Frequency of Detection	Maximum Detected Concentration	Geometric Mean Concentration
Volatile Organic Compounds (ug/kg)			
benzene	8/17	52,300	621
chlorobenzene	7/17	258,000	887
chloroform	2/17	379,000	257
1,1 - dichloroethane	3/17	179,000	461
1,2 - dichloroethane	4/17	290,000	413
1,2 - trans-dichloroethylene	5/17	512,000	288
ethylbenzene	15/17	529,000	4,330
methyl ethyl ketone	5/17	795,000	1,300
methylene chloride	8/17	14,900	565
1,1,2,2 - tetrachloroethane	1/17	703	NC
tetrachloroethylene	12/17	1,690,000	2,760
toluene	16/17	2,270,000	15,700
1,1,1 - trichloroethane	3/17	1,770,000	473
1,1,2 - trichloroethane	1/17	15,700	NC
trichloroethylene	8/17	1,670,000	856
vinyl chloride	1/17	28.9	NC
m-xylene	16/17	1,580,000	12,200
o+p - xylenes	16/17	710,000	10,500

Semi-Volatile Compounds (ug/kg)			
acenaphthene (NC)	8/17	21,200	443
acenaphthylene (NC)	1/17	21,000	NC
anthracene (NC)	7/17	2,950	474
benzidine	1/17	244,000	NC
benzo(a)anthracene (C)	5/17	84,200	1,200
benzo(a)pyrene (C)	7/17	108,000	649
benzo(b)fluoranthene (C)	6/17	164,000	1,730
benzo(g,h,i)perylene (NC)	5/17	73,300	671
bis (2-ethylhexyl)phthalate	14/17	381,000	14,400
butylbenzylphthalate	6/17	73,600	1,990
2 - chloronaphthalene	4/17	18,200	282
chrysene (C)	7/17	106,000	633
1,2 - dichlorobenzene	6/17	385,000	499
diethyl phthalate	1/17	28,500	NC
2,4 - dimethylphenol	3/17	10,800	382
di-n-butyl phthalate	6/17	98,200	1,750
di-n-octyl phthalate	5/17	19,500	1,190
fluoranthene (NC)	13/17	176,000	1,460
fluorene (NC)	9/17	94,100	549

100418

SUMMARY OF CHEMICAL CONCENTRATIONS  
IN MEDIUM DEPTH (5-6') SOIL

Chemical (Concentration Units)	Frequency of Detection	Maximum Detected Concentration	Geometric Mean Concentration
Semi-Volatile Compounds (ug/kg) (continued)			
indeno(1,2,3-c,d)pyrene (C)	4/16	86,900	697
naphthalene (NC)	14/17	480,000	1,690
nitrobenzene	1/17	1,350,000	NC
N-nitrosodiphenylamine	1/17	157	NC
phenanthrene (NC)	9/17	268,000	1,960
phenol	4/17	790,000	405
pyrene (NC)	12/17	118,000	1,130
1,2,4 - trichlorobenzene	2/17	4,930	222
Pesticides/PCBs (ug/kg)			
aldrin	1/14	1,200	NC
dieldrin	3/13	940	23
methoxychlor	1/17	150,000	NC
PCBs:			
Aroclor 1242	12/17	350,000	1,330
Aroclor 1248	2/17	9,700	84
Aroclor 1254	3/15	3,500	185
Aroclor 1260	2/17	10,000	179
Inorganic Chemicals (mg/kg)			
antimony	4/17	38	4.5
arsenic	15/17	62	7.8
beryllium	17/17	1.3	0.49
cadmium	16/17	26	3.9
chromium	17/17	542	57
copper	17/17	8,600	431
cyanide	9/17	0.032	0.001
lead	17/17	2,810	271
mercury	16/17	13.6	0.75
nickel	17/17	116	29
selenium	3/17	2.1	0.45
silver	1/17	40	NC
zinc	17/17	1,870	338

ND - Not detected.

NC - Not calculated since chemical was detected in only one sample.

(C) - Carcinogenic PAH.

(NC) - Noncarcinogenic PAH.

## SUMMARY OF CHEMICAL CONCENTRATION IN DEEP SOIL SAMPLES

Chemicals (Concentration Units)	Frequency Of Detection	Maximum Detected Concentration	Geometric Mean Concentration
<b>Volatile Organic Compounds (ug/kg)</b>			
Benzene	3/17	1,010	43
Chlorobenzene	2/17	115	21
Chloroform	2/17	10,300	22
1,1-Dichloroethane	2/17	234	21
1,2-Dichloroethane	4/17	6,500	36
1,2-trans-Dichloroethylene	6/17	12,200	37
Ethylbenzene	7/17	45,600	106
Methyl ethyl ketone	10/17	31,500	360
Methylene chloride	8/17	7,260	77
1,1,2,2-Tetrachloroethane	1/17	32.4	NC
1,1,1-Trichloroethane	3/17	57,600	34
m-Xylene	10/17	135,000	237
o-p-Xylenes	8/17	87,900	201
Styrene	1/17	212	NC
Tetrachloroethylene	7/17	917,000	113
Toluene	14/17	216,000	290
Trichloroethylene	7/17	343,000	45
Vinyl chloride	1/17	11,774	NC
<b>Semi-Volatile Compounds (ug/kg)</b>			
Acenaphthene (NC)	1/17	100	NC
Anthracene (NC)	3/17	181	52
Benzo(a)anthracene (C)	1/17	564	NC
Benzo(a)pyrene (C)	10/17	4,740	261
Benzo(b)fluoranthene (C)	1/17	576	NC
Benzo(g,h,i)perylene (NC)	1/17	227	NC
Bis(2-ethylhexyl)phthalate	13/17	3,360	2,140
Butylbenzylphthalate	3/17	4,690	380
Chrysene (C)	4/17	1,340	83
1,2-Dichlorobenzene	6/17	10,800	108
Di-n-butylphthalate	3/17	2,440	388
Di-n-octylphthalate	3/17	5,610	379
Fluoranthene (NC)	7/17	23,201	125
Fluorene (NC)	2/17	186	52
Indeno(1,2,3-cd)pyrene (C)	1/17	213	NC
Isophorone	3/17	725	83
Naphthalene (NC)	10/17	2,270	168
Phenanthrene (NC)	5/17	3,250	196
Phenol	2/17	14,400	86
Pyrene (NC)	8/17	1,840	108
<b>Pesticides/PCBs (ug/kg)</b>			
Dieldrin	3/17	210	4.1
Aroclor 1242	11/17	5,400	121
Aroclor 1248	3/17	2,600	22
Aroclor 1254	3/17	2,200	38
Aroclor 1260	3/17	1,000	39
<b>Inorganic Chemicals (mg/kg)</b>			
Antimony	2/17	29	3.6
Arsenic	10/17	18	2.8
Beryllium	17/17	0.74	0.48
Cadmium	10/17	132	0.72
Chromium	17/17	56	20.2
Copper	17/17	11,900	66.7
Lead	15/17	916	28.7
Mercury	10/17	13.6	0.16
Nickel	17/17	44	14.1
Selenium	2/17	1.3	0.28
Silver	2/17	1.2	0.55
Zinc	17/17	4,600	92

NC = Not calculated because chemical was detected in only one sample.  
 ND = Not detected.

(C) = Carcinogenic PAN  
 (NC) = Noncarcinogenic PAN

SUMMARY OF CHEMICAL CONCENTRATIONS  
DETECTED IN VERY DEEP SOIL SAMPLES

Chemical (Concentration Units)	Frequency of Detection	Maximum Detected Concentration (ug/kg)	Geometric Mean Concentration (ug/kg)
Volatile Organic Compounds (ug/kg)			
chlorobenzene	2/16	31,523	199
chloroform	6/16	333,000	217
1,1 - dichloroethane	1/16	698	NC
1,2 - dichloroethane	3/16	59,900	206
1,2 - trans-dichloroethylene	2/16	13,820	88
ethyl benzene	2/16	69,606	221
methyl ethyl ketone	8/16	69,000	1,180
methylene chloride	15/16	99,100	2,250
tetrachloroethylene	14/16	536,013	2,220
toluene	13/16	469,276	1,120
1,1,1 - trichloroethane	2/16	200,449	348
trichloroethylene	16/16	1,071,522	6,630
m-xylene	9/16	191,660	523
o+p - xylenes	5/16	117,053	319
Semi-Volatile Compounds (ug/kg)			
2-chlorophenol	1/7	238	NC
1,2-dichlorobenzene	2/7	465	79
isophorone	1/7	151	59
nitrobenzene	5/7	718	154
phenol	1/7	434	NC
Pesticides/PCBs (ug/kg)			
PCBs: Aroclor 1242	3/7	370	33

**TANK SLUDGE SAMPLING DATA  
SCP/CARLSTADT, NEW JERSEY**

<b>Constituent</b>	<b>Characteristics and Concentrations</b>
Specific Gravity	1.37
Total Solids	64.76%
Water Content	4%
Flash Point	> 212°F
Ash Content	23.62%
Heating Value	6,940 BTU/lb
Aluminum, as Al	29.30 mg/L
Arsenic, as As	7.07 mg/L
Barium, as Ba	2620 mg/L
Cadmium, as Cd	98.7 mg/L
Chromium, as Cr	12,300 mg/L
Copper, as Cu	2,830 mg/L
Lead, as Pb	50,700 mg/L
Mercury, as Hg	1,560 mg/L
Nickel, as Ni	32.3 mg/L
Selenium, as Se	< 0.020 mg/L
Silver, as Ag	2.90 mg/L
Zinc, as Zn	1,410 mg/L
Beryllium, as Be	4.51 mg/L
Potassium, as K	291 mg/L
Total Sulfur	4,930 mg/L
Total Chlorides, as Cl	109,000 mg/L
Total Fluorides, as F	879 mg/L
Total Cyanides	<10 mg/L
Oil and Grease	23.6%
PCB, Aroclor 1242	32,300.00 mg/L

**Note:** Concentrations based on a single sample taken  
by USEPA and analyzed by Chemical Waste Management  
on 9 May 1986

**Source:** USEPA Region II SCP/Carlstadt File

\* mg/L; ppm

SUMMARY OF CHEMICAL CONCENTRATIONS  
DETECTED IN VERY DEEP SOIL SAMPLES

Chemical (Concentration Units)	Frequency of Detection	Maximum Detected Concentration (ug/kg)	Geometric Mean Concentration (ug/kg)
Inorganic Compounds (mg/kg)			
.....			
arsenic	5/7	5.5	1.7
beryllium	7/7	1.2	1.0
cadmium	1/7	0.28	0.15
chromium	7/7	33	28
copper	7/7	39	30
lead	6/7	17	7.2
nickel	7/7	37	3.0
zinc	7/7	87	71

NC - Not calculated since chemical was detected in only one sample.

ND - Not detected.

CONCENTRATIONS OF CHEMICALS DETECTED IN THE WATER  
TABLE AQUIFER AT THE SCP SITE

F-9

(UNFILTERED SAMPLES)

Chemical	Frequency of Detection (a)	Concentration (ug/l)	
		Geometric Mean (b)	Maximum Detected Value (b)
Volatile Compounds			
Benzene	10/14	318	7,270
Chlorobenzene	3/14	9.8	4,020
Chloroethane	1/14	NC	2,620
Chloroform	4/14	38.1	614,000
1,1-Dichloroethane	8/14	84.5	11,700
1,2-Dichloroethane	4/14	33.9	473,000
1,1-Dichloroethylene	1/14	NC	32
1,2-trans-Dichloroethylene	12/14	2,270	64,700
Ethylbenzene	6/14	35.9	3,900
Methylene Chloride	10/14	522	200,000
Methyl ethyl ketone	5/14	168	2,000,000
1,1,2,2-Tetrachloroethane	4/14	17.0	7,350
Tetrachloroethylene	3/14	16.2	24,500
Toluene	14/14	10,500	90,900
1,1,1-Trichloroethane	7/14	58.8	81,200
Trichloroethylene	8/14	345	161,000
Vinyl Chloride	9/14	106	7,290
m-Xylene	6/14	49.2	20,400
o + p-Xylenes	8/14	123	15,200
Semi-Volatile Compounds			
Total CPANs (c)	2/14	6.8	379.5
Total MCPANs (d)	13/14	30.7	2706.9
bis(2-Chloroethyl)ether	2/14	11.1	1,390
bis(2-Ethyl hexyl)phthalate	5/14	17.1	634
Butyl benzyl phthalate	1/14	NC	10.4
2-Chloronaphthalene	1/14	NC	18.9
2-Chlorophenol	2/14	5.9	17.8
1,2-Dichlorobenzene	12/14	34.8	192
2,4-Dichlorophenol	2/14	9.1	443
Diethyl phthalate	2/14	7.6	416
2,4-Dimethyl phenol	11/14	53.9	1,090
Dimethyl phthalate	1/14	NC	316
Di-n-butyl phthalate	2/14	7.2	318
Isophorone	5/14	24.3	8,450
Nitrobenzene	4/14	65.0	57,900
2-Nitrophenol	1/14	NC	4.73
Phenol	14/14	510	17,100
Pesticides/PCBs			
Beta-BHC	1/14	NC	0.56
Total DDT and compounds	3/14	0.09	1.7
Endrin aldehyde	2/14	0.09	15.0
Endosulfan I	1/14	NC	0.25
Endrin	1/14	NC	0.65
Total PCBs (e)	6/14	1.9	17,000
Inorganics			
Arsenic	10/14	30.7	3,100
Beryllium	4/14	1.2	4.3
Cadmium	4/14	3.5	16
Chromium	7/14	26.3	450
Copper	14/14	341	1,580
Cyanide	11/14	0.07	4.52
Lead	5/14	14.3	1,500
Mercury	10/14	0.49	4.4
Nickel	12/14	55.5	180
Zinc	14/14	92.4	2,970

(a) Frequency of detection based on 14 samples, two from each sampling station.

(b) Geometric means and maximums were calculated after the geometric mean of the two samples from each station were calculated. The listed maximum is, however, the maximum value detected in any sample.

(c) CPANs = Carcinogenic PANs. Those detected in groundwater were: benzo(a)pyrene, chrysene, fluoranthene and fluorene.

(d) MCPANs = Noncarcinogenic PANs. Those detected in groundwater were: acenaphthene, acenaphthylene, anthracene, naphthalene, phenanthrene and pyrene.

(e) Includes all Aroclors detected at site [1242].

NC = Not calculated since chemical was detected in only one sample.

100424

CONCENTRATIONS OF CHEMICALS DETECTED IN THE  
TILL AQUIFER AT THE SCP SITE

(UNFILTERED SAMPLES)

Chemical	Frequency of Detection (a)	Concentration (ug/l)	
		Geometric Mean (b)	Maximum Detected Value (b)
Volatile Compounds			
Chlorobenzene	2/6	4.6	39.7
Chloroform	5/6	324	28,600
1,1-Dichloroethane	1/6	NC	27
1,2-Dichloroethane	5/6	144	9,230
1,1-Dichloroethylene	3/6	17.3	313
1,2-trans-Dichloroethylene	3/6	11.6	190
Methylene Chloride	6/6	101	1210
Tetrachloroethylene	4/6	26.7	996
Toluene	2/6	3.1	10.1
1,1,1-Trichloroethane	4/6	29.5	417
Trichloroethylene	6/6	410	16,600
Vinyl Chloride	1/6	NC	54.3
Semi-Volatile Compounds			
1,2-Dichlorobenzene	2/6	5.4	7.46
Nitrobenzene	3/6	7.2	23.3
Phenol	1/6	NC	2.16
Pesticides/PCBs			
Total PCBs (c)	1/6	NC	1.8
Inorganics			
Copper	1/6	NC	19
Zinc	5/6	29.5	57

(a) Frequency of detection based on 6 samples, two from each of the three sampling stations.

(b) Geometric means and maximums were calculated after the geometric mean of the two samples from each station were calculated. The listed maximum is, however, the maximum value detected in any sample.

(c) Includes all Aroclors detected at site.

NC = Not calculated because chemical was detected in only one sample.

CONCENTRATIONS OF CHEMICALS DETECTED IN THE BEDROCK AQUIFER  
AT THE SCP SITE

(UNFILTERED SAMPLES)

Chemical	Frequency of Detection (a)	Concentration (ug/l)	
		Geometric Mean	Maximum Detected Value
<u>Volatile Compounds</u>			
Chloroform	2/2	870	830
1,2-Dichloroethane	2/2	420	460
1,1-Dichloroethylene	1/2	NC	2
1,2-trans-Dichloroethylene	1/2	NC	3
Methylene chloride	1/2	NC	21
Tetrachloroethylene	1/2	NC	2
Toluene	1/2	NC	15
1,1,1-Trichloroethane	1/2	NC	8
Trichloroethylene	2/2	240	310
Vinyl chloride	2/2	28	56
<u>Inorganics</u>			
Aluminum	1/1	NC	863
Barium	1/1	NC	142
Calcium	1/1	NC	209,000
Chromium	1/1	NC	27.6
Copper	1/1	NC	52.3
Lead	1/1	NC	2.6
Magnesium	1/1	NC	1,380
Potassium	1/1	NC	3,100
Sodium	1/1	NC	60,500
Vanadium	1/1	NC	7
Zinc	1/1	NC	7.8

(a) Frequency of detection based on two samples for organics and one sample for inorganics. The samples were taken from a single monitoring well on two separate dates.

NC = Not calculated since chemical was detected in only one sample.

CHEMICAL CONCENTRATIONS IN SURFACE WATER SAMPLES  
AT PEACH ISLAND CREEK

(All concentrations in ug/liter)

	100 Feet Upstream (Loc. 4)	Adjacent to site (Loc. 3)	100 Feet Downstream (Loc. 2)	Confluence with Berry's Creek (Loc. 1)
<b>Volatiles</b>				
<b>Aliphatic Organic Compounds</b>				
Acetone	ND	8.34	12.20	ND
Chloroform	ND	3.58	3.56	ND
trans-Dichloroethylene	ND	35.20	33.30	3.91
Ethyl methyl ketone	75	45.40	49.20	ND
ethylene chloride	4.63	6.12	12.90	14.90
1,1-Trichloroethane	ND	6.32	5.54	ND
Benzene	ND	20.60	48.10	ND
Chloroethylene	ND	3.83	ND	ND
Styrene	ND	ND	10.70	ND
Xylenes	ND	ND	10.00	ND
<b>Aromatic Organic Compounds</b>				
Phenol	56	ND	28	ND
Chlorophenol	100	29	27	12
Nitrophenol	4.8	0.96	1.1	2.1
Phenylamine	57	33	27	ND
Phenylamine	370	160	150	87

Not detected.

SUMMARY OF CHEMICAL CONCENTRATIONS  
IN SHALLOW SEDIMENTS (0-6 INCHES)

Chemical	Concentration			
	100 Feet Upstream (Loc. 4)	Adjacent to Site (Loc. 3)	100 Feet Downstream of Site (Loc. 2)	Confluence with Berry's Creek (Loc. 1)
Volatile Organic Compounds (ug/kg)				
Benzene	ND	ND	ND	82.5
Chlorobenzene	3,990	ND	17,100	200
Chloroform	ND	ND	3,690	ND
Ethylbenzene	4,610	39,000	35,100	ND
Methyl ethyl ketone	ND	ND	18,300	65.2
Methylene chloride	ND	ND	ND	42.3
m-Xylene	13,300	1,060,000	72,000	168
o-p-Xylenes	11,000	647,000	74,200	467
Tetrachloroethylene	ND	953,000	ND	ND
Toluene	41,500	2,970,000	322,000	ND
1,1,1-Trichloroethane	ND	222,000	ND	ND
Trichloroethylene	ND	9,950,000	ND	ND
Pesticides/PCBs (ug/kg)				
Dieldrin	ND	11,000	ND	ND
PCBs:				
Arochlor 1242	21,000	55,000	35,000	ND
Arochlor 1248	ND	ND	ND	19,000
Arochlor 1254	ND	ND	ND	5,200
Arochlor 1260	10,000	ND	6,000	ND
Semi-Volatiles (ug/kg)				
1,2,4-Trichlorobenzene	525	ND	ND	ND
1,2-Dichlorobenzene	1,850	3,670	424	ND
1-Chloronaphthalene	ND	ND	115	ND
Benaphthene	ND	ND	166	ND
Benzo(a)pyrene	ND	ND	148	ND
Bis(2-ethylhexyl)phthalate	108,000	32,600	32,000	2,920
Diethyl benzyl phthalate	ND	ND	736	ND
Dibenzofuran	ND	ND	332	ND
Di-n-octylphthalate	ND	ND	600	ND

SUMMARY OF CHEMICAL CONCENTRATIONS  
IN SHALLOW SEDIMENTS (0-6 INCHES)

Chemical	Concentration			
	100 Feet Upstream (Loc. 4)	Adjacent to Site (Loc. 3)	100 Feet Downstream of Site (Loc. 2)	Confluence with Berry's Creek (Loc. 1)
Semi-Volatiles (ug/kg) (Cont'd)				
Di-n-butylphthalate	2,350	ND	ND	ND
Fluoranthene	928	ND	374	ND
Fluorene	536	ND	202	ND
Naphthalene	1,330	816	1,230	ND
Phenanthrene	1,820	ND	712	ND
Pyrene	916	ND	339	ND
2,4-Dimethylphenol	1,360	ND	ND	ND
Phenol	24,900	10,200	ND	ND
Inorganics (mg/kg)				
Arsenic	37	ND	ND	34
Beryllium	2.4	1	0.39	0.7
Cadmium	84	43	12	32
Chromium	819	345	156	1,060
Copper	9,510	2,000	1,240	861
Cyanide, total	0.12	0.21	0.001	0.005
Lead	320	520	340	360
Mercury	41	25	0.34	139
Nickel	467	110	96	100
Selenium	ND	ND	ND	0.89
Silver	2.4	2.7	ND	8.6
Thallium	1.0	ND	ND	1.1
Zinc	3,110	2,320	411	2,880

ND = Not detected.

SUMMARY OF CHEMICALS CONCENTRATIONS IN SAMPLES OF DEEP SEDIMENTS

Chemical	Concentration			
	100 Feet Upstream (Location 4)	Adjacent to Site (Location 3)	100 Feet Downstream of Site (Location 2)	Confluence With Berry's Creek (Location 1)
<b>VOLATILE ORGANIC COMPOUNDS (ug/kg)</b>				
1,1,1-Trichloroethane	ND	75,500	ND	ND
1,2-Dichloroethane	1,960	ND	ND	ND
1,2-trans-Dichloroethylene	1,160	ND	ND	ND
Benzene	1,990	ND	5,785	33.4
Chlorobenzene	4,930	ND	ND	47.3
Chloroethane	ND	ND	2,127	ND
Chloroform	3,790	ND	ND	ND
Ethylbenzene	7,420	174,000	ND	29.7
Methyl ethyl ketone	31,900	ND	ND	ND
Methylene chloride	3,690	ND	ND	ND
Tetrachloroethylene	ND	304,000	ND	ND
Toluene	74,500	1,700,000	726	ND
Trichloroethylene	1,890	3,260,000	ND	ND
m-Xylene	17,200	486,000	5,796	93.8
o-p-Xylenes	16,000	348,000	9,481	141
<b>BASE NEUTRALS (ug/kg)</b>				
1,2,4-Trichlorobenzene	177	2,330	ND	ND
1,2-Dichlorobenzene	445	261,000	832	ND
Bis(2-ethylhexyl)phthalate	32,600	240,000	95,651	3,700
Butyl benzyl phthalate	ND	9,700	ND	ND
Chrysene	ND	ND	1,010	ND
Dibenzo(a,h)anthracene	ND	ND	870	ND
Di-n-butyl phthalate	884	24,800	2,791	ND
Di-n-octyl phthalate	ND	12,200	938	ND
Fluoranthene	381	ND	1,445	334
Naphthalene	379	20,300	1,014	ND
Phenanthrene	556	ND	2,549	ND
Phenol	6,560	44,700	ND	ND
Pyrene	343	ND	1,254	ND
<b>PESTICIDES/PCBs</b>				
<b>PCBs:</b>				
Aroclor 1242	8,880	770,000	21,675	ND
Aroclor 1248	ND	ND	ND	42,000
Aroclor 1254	ND	ND	ND	5,500
Aroclor 1260	2,800	ND	11,099	ND
<b>INORGANICS (mg/kg)</b>				
Arsenic	15	22	7.4	31
Beryllium	1.4	2	0.62	0.43
Cadmium	29	74	30	28
Chromium	257	504	258	1,170
Copper	2,230	2,590	1,213	835
Lead	96	230	232	370
Cyanides, total	0.02	0.01	0.014	0.002
Mercury	18	41	1.93	1,390
Nickel	203	413	228	140
Silver	ND	ND	ND	7.6
Thallium	ND	1.1	ND	1.2
Zinc	1,060	2,540	945	3,680



APPENDIX G  
PROPERTY ACCESS AGREEMENT

100432

**Canonie**Environmental

# SCHENCK, PRICE, SMITH & KING

ATTORNEYS AT LAW

10 WASHINGTON STREET

CN-805

MORRISTOWN, N.J. 07963-0805

TELEPHONE 201-938-1000

TELECOPIER (201) 540-7300

CLIFFORD W. STARRETT  
EDWARD J. FARRELL\*  
ROBERT W. KING  
CLINTON J. CURTIS  
DONALD W. BEDELL\*\*  
JAMES E. DAVIDSON  
JULIUS J. DENZLER\*  
WILLARD BERGMAN, JR.\*  
EDWARD WARD AHART\*\*  
STEPHEN G. SEPANIAK\*  
MITCHELL H. COBERT\*  
DOUGLAS S. BRIERLEY\*  
EDWARD J. TRAWINSKI\*  
HOWARD P. SHAW  
GILBERT S. LEEDS\*  
PATRICIA GARTY SMITS\*  
ANITA JOY SIEGEL  
JAMES P. WYSE  
MICHAEL K. MULLEN  
M. SHEILAH O'MALLORAN  
ANNE E. ARONOVITCH

\*CERTIFIED CIVIL TRIAL ATTORNEY

\*ALSO MEMBER N.Y. BAR

\*ALSO MEMBER D.C. BAR

\*ALSO MEMBER FLA. BAR

\*ALSO MEMBER PA. BAR

†MEMBER N.Y. AND D.C. BARS ONLY

JOHN M. ELIAS†  
JOHN M. DEMARCO\*  
JEANNE ANN McMANUS  
JAMES B. GARLAND  
MICHAEL A. MORONEY\*  
GREGORY J. COFFEY  
WILLIAM J. COURTNEY†  
ANTHONY F. DELLA PELLE\*  
LAURI L. ORFANELLI†  
MAGDA DEMOYA  
JAMES A. RYBA

OF COUNSEL  
BEN D. WHITE  
FRANK J. VALGENTI, JR.  
LISA K. PANTEL

NEW YORK OFFICE  
261 MADISON AVENUE, SUITE 800  
NEW YORK, NEW YORK 10016  
TELEPHONE 212-686-6482

December 4, 1990

Susan E. Hoffman, Esq.  
Cohen, Shapiro, Polisher, Shiekman & Cohen  
1009 Lenox Drive, Bldg. 4  
Lawrenceville, N.J. 08648

Re: 216 Paterson Plank Road, Carlstadt, N.J.  
NPL Site: Access to Perform Interim Remedy

Dear Ms. Hoffman:

This is in response to your letter dated November 13, 1990, regarding access to the Carlstadt site to be provided by Inmar Associates, Inc. ("Inmar").

As you may be aware, the Commissioner of the Department of Environmental Protection was appointed custodian of the Carlstadt site with responsibility for physical security and authority to exclude and provide access by Order of June 16, 1983, in an action entitled State of New Jersey Department of Environmental Protection v. Scientific Chemical Processing, Inc., et als., Docket No. C1852-83E. Accordingly, to the extent that Inmar possesses a right to convey access to the Carlstadt site by virtue of this Order appointing the Commissioner of DEP as custodian, Inmar agrees to provide access to the Carlstadt site for implementation and construction of the interim remedy. I will be forwarding to you under separate cover a revised Access Agreement executed by Inmar Associates, Inc. for this purpose.

With reference to the issue relating to a thirty-foot strip of property situate between Carolina Freight and the eastern border of the site, I have undertaken to conduct an inquiry into the various title policies and surveys prepared on Inmar's behalf in connection with acquisition of this site. I will be contacting

SCHENCK, PRICE, SMITH & KING

December 4, 1990

Page 2

you in the near future to discuss the handling of this matter.  
Please do not hesitate to contact me if you have any question with  
regard to the foregoing.

Very truly yours,

SCHENCK, PRICE, SMITH & KING



By: Gregory J. Coffey

GJC:EK  
Enc.

cc: Mr. James Rooney, EPA  
C. W. Starrett, Esq.

100434



APPENDIX H  
PRELIMINARY PERFORMANCE ANALYSIS OF DEWATERING WELLS

APPENDIX H  
PRELIMINARY PERFORMANCE ANALYSIS OF EXTRACTION WELLS

1.0 WELL YIELD FORMULA

The shallow monitoring wells to be used for dewatering the shallow aquifer are 12-feet deep, screened 8 feet from the bottom with 4-inch diameter well screens made of stainless steel, and installed in 8-inch diameter borings. For the purpose of this dewatering evaluation, the fill and peat units will be considered a single unit with identical geohydrologic properties. The yield from these wells can be estimated from the following formula for a well fully penetrating the water table aquifer:

$$Q = (PI) * K * (H^{**2} - hw^{**2}) / \ln(R/r).$$

Where:

- Q = Well yield (cubic feet/day);
- PI = 3.14;
- K = Hydraulic conductivity of the aquifer (feet/day);
- H = Saturated thickness of the aquifer (feet);
- hw = Height of the water column in the well (feet);
- R = Influence radius (feet);
- r = Well radius feet.

## 2.0 WELL HYDRAULICS PARAMETERS

Discussed below are the key parameter values to be used to estimate the well yield:

K = Hydraulic conductivity

Based on the Remedial Investigation (RI) Report, the hydraulic conductivity of the fill unit ranges from  $10^{-4}$  centimeters (cm) /seconds (sec) to  $10^{-2}$  cm/sec and the average is considered to be about  $10^{-3}$  cm/sec or 2.83 feet/day. The peat unit has a higher hydraulic conductivity of about  $10^{-2}$  cm/sec or 28.3 feet/day. Because the peat layer is thinner than the fill and its hydraulic conductivity could decrease due to compression accompanied by dewatering, an average hydraulic conductivity of 2.83 feet/day is selected for well yield analysis.

H = Saturated thickness

The saturated thickness is the combined thickness of the fill and peat units below the water table. The representative value for the saturated thickness is about eight feet.

hw = Height of water column in the well

However, the hw value for well hydraulics calculation is the height of water column above the bottom of the aquifer. Therefore, the hw value is three feet by subtracting the drawdown of five feet from the saturated thickness of eight feet.

R = Influence Radius

For a typical water table aquifer, the influence radius increases until a sufficient recharge zone is intercepted. For the FOU, the influence radius will be very small because the pump will not operate once the storage tank is full or the well water column drops to less than five feet, allowing the water table near the well to recover. The pumping would resume after the water table recovers and therefore, the influence radius is not expected to exceed 20 feet. The well yield will be calculated at two R values of 5 feet and 20 feet to obtain the typical range of well yield during a single pumping period. Because of the small value selected, the influence radii of different wells will not overlap to affect the well yield.

$r$  = Well radius

The radius of the shallow monitoring wells is four inches (0.33 feet).

## 3.0 WELL YIELD ESTIMATE

Using the well hydraulics parameters given above, the well yield was estimated at five different water table levels to represent the declining water table with time. The well yield equation becomes:

$$Q(\text{high}) = 3.14 * 2.83 * (H * H - 9) / \ln(5/0.33) = 3.27 * (H * H - 9);$$

$$Q(\text{low}) = 3.14 * 2.83 * (H * H - 9) / \ln(20/0.33) = 2.17 * (H * H - 9).$$

For H = 8:

Q(high) = 180 cubic feet per day (cfd), Q(low) = 119 cfd, Average = 1,120 gallons per day (gpd);

Total yield from seven wells = 7,840 gpd.

For H = 7:

Q(high) = 131 cfd, Q(low) = 87 cfd, Average = 815 gpd;

Total yield from seven wells = 5,705 gpd.

For H = 6:

Q(high) = 88 cfd, Q(low) = 59 cfd, Average = 550 gpd;

Total yield from seven wells = 3,850 gpd.

For H = 5:

Q(high) = 52 cfd, Q(low) = 35 cfd, Average = 325 gpd;

Total yield from seven wells = 2,275 gpd.

For H = 4:

Q(high) = 23 cfd, Q(low) = 15 cfd, Average = 142 gpd;

Total yield from seven wells = 994 gpd.

#### 4.0 TRANSPORTATION AND SCHEDULE

Figure H-1 presents the total yield from seven wells as the water table declines. Water will be removed at the rate it is produced. Assuming a tanker truck capacity of 5,000 gallons, the tanker operation and dewatering schedule would be as follows:

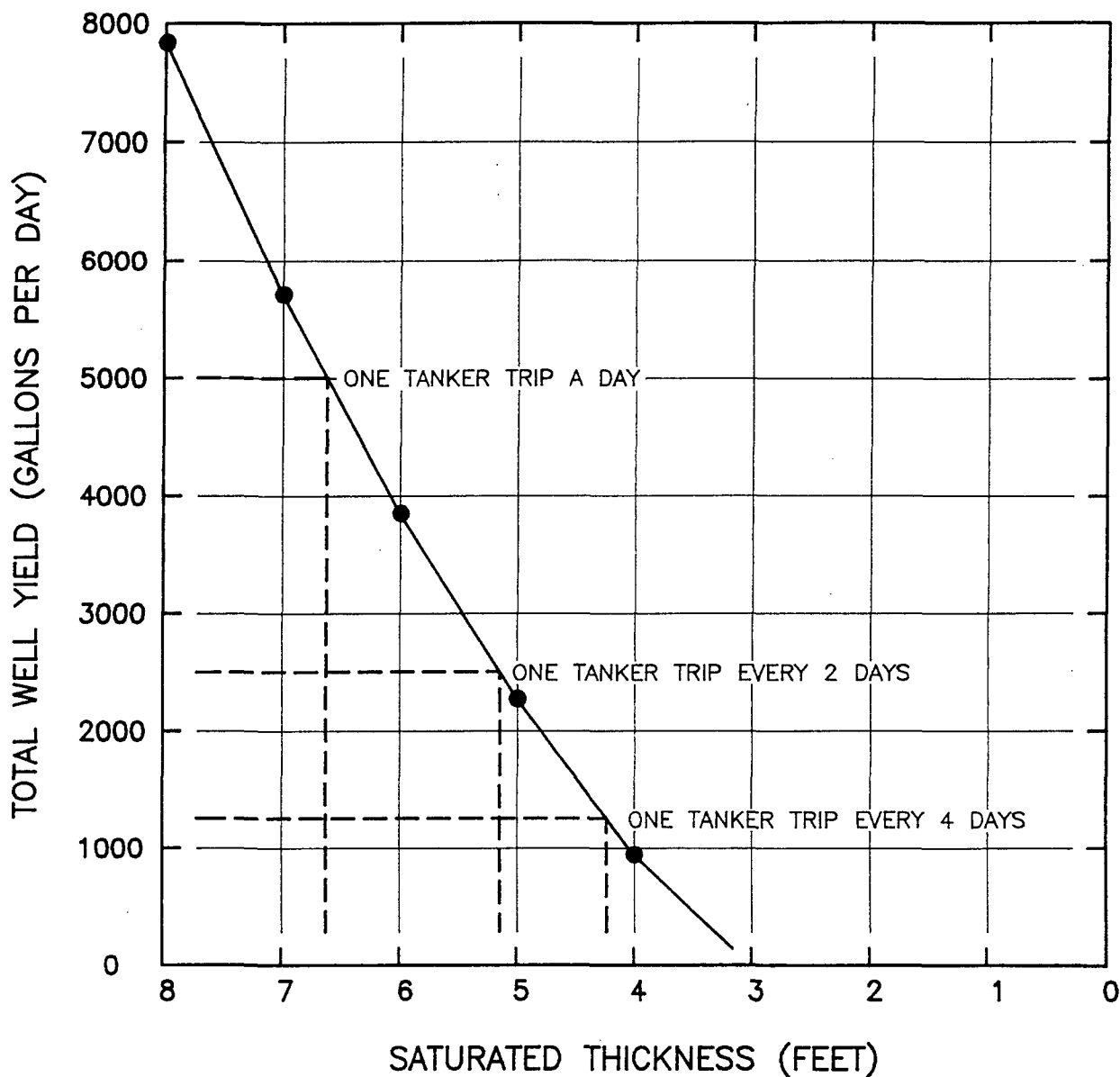
Step 1 - Until the water table declines to 6.7 feet (or 260,000 gallons of water is removed), water will be removed at the rate of one or more tanker trips a day (5,000 gpd) for 52 days.

Step 2 - Until the water table declines to 5.2 feet (or additional 300,000 gallons of water is removed), water is removed at a rate of one tanker truck every two days for 120 days.

Step 3 - Until the water table declines to 4.25 feet (or additional 190,000 gallons of water is removed), water is removed at a rate of one tanker trip every four days for 152 days.




The initial dewatering operations is defined as all dewatering occurring prior to November 18, 1990. According to this schedule, the first 400,000 gallons would be removed within three months after starting dewatering operation. Over a period of about one year, 750,000 gallons of water would be removed. It will take a longer time to remove the remaining drainable volume of 350,000 gallons. As a result, lowering the water table by five feet may be achieved in about 18 months after starting the dewatering operation.

This evaluation is based on measurement of certain site parameters and estimates of other geohydrologic parameters, particularly the specific yield and the hydraulic conductivity. The possible upper limit of the total drainable water may be as much as 1.5 million gallons and the actual pumping rate could be two to three times higher than the figures derived in this appendix.



TOTAL WELL YIELD  
WITH DECLINING WATER TABLE  
INTERIM REMEDY  
CARLSTADT, NEW JERSEY

PREPARED FOR  
COOPERATING PRP GROUP  
**Canonie** Environmental

	3/21/91	ISSUED FOR AGENCY REVIEW	WLH	SDP	B
	3-15-91	ISSUED FOR CLIENT REVIEW	WLH	J.K.S.	
	12-6-90	ISSUED FOR AGENCY REVIEW	WLH	S.D.P.	J.K.S.
No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	APP'D BY

DATE: 11-21-90  
SCALE: NONE

FIGURE H-1

DRAWING NUMBER  
90-198-A23